SUPPLEMENTARY INFORMATION

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Supplementary Tables

Supplementary Note

Supplementary Table 1 | Details of the 58 studies that contributed to the discovery phase for age at menarche.

Type[a]	Study Name / acronym	Full Study name	N	GC Factor	Mean age (SD)	Mean AAM (SD)	Mean birth year	SNP array	Imputation program	Analysis program	Specific Menarche question
Discovery - previous	WGHS	Women's Genome Health Study	22028	1.10	54.7 (7.1)	12.4 (1.4)	1939	Illumina HumanHap300 Duo "+"	MACH	MACH2QTL	At what age did your menstrual periods begin?'' with response categories ''9 or younger; 10; 11; 12; 13; 14; 15; 16; 17 or older.''
Discovery - previous	deCODE	deCODE Genetics, Iceland	15864	1.28	-	13.2 (1.3)	1948	Illumina HumanHap 300K and 370K CNV	IMPUTE	In house	How old were you when your menstruation started?
Discovery - previous	ARIC	Atherosclerosis Risk in Communities Study	4247	1.03	53.9 (5.7)	12.9 (1.5)	-	Affymetrix 6.0	MACH	ProABEL	"At approximately what age were you when your menstrual periods started?"
Discovery - previous	FHS	Framingham Heart Study	3801	1.01	42.5 (10.1)	12.8 (1.5)	1952	Affymetrix 500K + Affymetrix 50K	MACH	R-packages	"Age at start of menses" and "How old were you when you had your first menstrual period (menses)?" "About how old were you when you had your first menstrual period?"
Discovery - previous	QIMR	Queensland Institute of Medical Research	3528	1.03	-	13.1 (1.3)	1964	Illumina Human610-Quadv1 and 370K CNV	MACH	MERLIN-fastassoc	"How old were you when you had your first menstrual period?"
Discovery - previous	RS1	Rotterdam Study 1	3175	1.02	69.6 (9.3)	13.5 (1.6)	1922	Illumina HumanHap 550K	MACH	MACH2QTL	"How old were you when you had your first menstrual period?"
Discovery - previous	NHS - HU	Nurses' Health Study	3090	1.02	55.7 (6.7)	12.5 (1.4)	-	Affymetrix 6.0	MACH	ProABEL	At what age did your menstrual periods begin?
Discovery - previous	CoLaus	Cohort Lausannoise	2797	1.00	53.4 (10.8)	13.2 (1.6)	1954	Affymetrix 500K	IMPUTE	In house	At what age did you have your first period?
Discovery - previous	NFBC	Northern Finland Birth Cohort 1966	2648	1.03	31.2 (0.4)	12.9 (1.3)	-	Illumina Infinium 370CNV Duo	MACH	ProABEL	How old were you when you started menstruating
Discovery - previous	TwinsUK	Twins UK	2276	1.01	58.2 (12.7)	13.0 (1.6)	1951	Illumina HumanHap 300K	IMPUTE	GenABEL	"How old were you when you had your first menstrual period?"
Discovery - previous	NHS - CGEMS / BRCA	Nurses' Health Study	2270	1.03	56.8 (6.4)	12.5 (1.4)	-	Illumina HumanHap 550K	MACH	ProABEL	At what age did your menstrual periods begin?
Discovery - previous	SardiNIA	SardiNIA Study	2158	1.23	43.9 (17.2)	13.2 (1.6)	1960	Affymetrix 10K, 500K	MACH	ERLIN-fastass	"At what age did your menstrual periods begin?"
Discovery - previous	AGES-Reykjavik	Age, Gene/Environment Susceptibility Study	1849	1.03	76.3 (5.5)	13.6 (1.3)	-	Illumina HumanHap 370K CNV	MACH	PLINK	"At what age did your menstrual periods begin?"
Discovery - previous	DNBC	Danish National Birth Cohort, Preterm delivery study	1748	1.02	30.0 (4.3)	13.3 (1.3)	1970	Illumina Human660W-Quad BeadChip	MACH	MACH2QTL	How old were you when you had your first menstrual period?
Discovery - previous	Indiana	Indiana University premenopausal Caucasian women peak BMD study	1497	1.01	33.3 (7.2)	12.6 (1.4)	1966	Illumina HumanHap 610 Quad version 1B	IMPUTE	ERLIN-fastass	At what age did your periods begin? __Years old.
Discovery - previous	SAGE	Study of Addiction: Genetics and Environment	1291	1.00	38.4 (9.1)	12.8(1.6)	-	Illumina Human 1Mv1_C	IMPUTE	SNPTEST	At what age did you have your first menstrual period?
Discovery - previous	EPIC_Cohort	European Prospective Investigation into Cancer and Nutrition - Obesity study cohort	1215	0.97	58.7 (9.0)	12.9 (1.8)	1936	Affymetrix GeneChip 500K	IMPUTE	SNPTEST	How old were you when you had your first menstrual period?
Discovery - previous	RS2	Rotterdam Study 2	1119	1.00	65.1 (8.4)	13.3 (1.6)	1935	Illumina HumanHap 550K	MACH	MACH2QTL	"How old were you when you had your first menstrual period?"
Discovery - previous	RS3	Rotterdam Study 3	1112	1.01	56.2 (6.1)	13.1 (1.6)	1951	Illumina HumanHap 550K	MACH	MACH2QTL	"How old were you when you had your first menstrual period?"
Discovery - previous	ERF	Erasmus Rucphen Family study	1103	1.03	47.5 (14.3)	13.1 (1.7)	-	Illumina 6K, 318K, 370K, Afyymetrix 250K	MACH	ProABEL	"At what age did your menstrual periods begin?"
Discovery - previous	NTR	Netherlands Twin Register	1051	1.01	44.6 (13.6)	13.2 (1.4)	1961	Affymetrix 500K Perlegen	IMPUTE	SNPTEST	"How old were you when you had your first menstrual period?"
Discovery - previous	TwinsUKIII	Twins UK	1016	1.00	62.4 (11.6)	12.9 (1.5)	1946	Illumina Hap610Quad	IMPUTE	GenABEL	"How old were you when you had your first menstrual period?"
Discovery - previous	HBCS	Helsinki Birth Cohort Study	976	1.01	61.5 (3.0)	12.8 (1.5)	-	Illumina HumanHap610 quad (modified)	MACH	ProABEL	"At what age did your menstrual periods start?"
Discovery - previous	TwinsUKII	Twins UK	671	1.06	55.4 (14.6)	13.1 (1.6)	1953	Illumina Hap610Quad	IMPUTE	GenABEL	"How old were you when you had your first menstrual period?"
Discovery - previous	EPIC_Cases	European Prospective Investigation into Cancer and Nutrition - Obesity study cases	625	0.96	58.8 (8.8)	12.7 (2.0)	1936	Affymetrix GeneChip 500K	IMPUTE	SNPTEST	How old were you when you had your first menstrual period?
Discovery - previous	InCHIANTI	Invecchiare in Chianti, aging in the Chianti area	597	1.04	68.2 (15.5)	13.3 (1.5)	1930	Illumina HumanHap 550K	IMPUTE	SNPTEST	How old were you when you had your first menstrual period?
Discovery - previous	HAPI Heart Study / AMISH	The older order Amish population studies	557	1.05	49.1 (3.7)	13.1 (1.3)	1953	Affymetrix 500K and 6.0	MACH	MMAP	How old were you when you had your first menstrual period?
Discovery - previous	Health 2000 (Genmets) controls	Health2000 cohort - control subsample	465	1.023	51.9 (11.6)	13.4 (1.6)	-	Illumina HumanHap610 quad (modified)	MACH	ProABEL	How old were you when your periods started?
Discovery - previous	Health 2000 (Genmets) cases	Health2000 cohort - case subsample	457	0.999	51.8 (11.5)	13.4 (1.5)	-	Illumina HumanHap610 quad (modified)	MACH	ProABEL	How old were you when your periods started?

Supplementary Table 1 (continued) | Details of the 58 studies that contributed to the discovery phase for age at menarche.

Type[a]	Study Name / acronym	Full Study name	N	GC Factor	Mean age (SD)	Mean AAM (SD)	Mean birth year	SNP array	Imputation program	Analysis program	Specific Menarche question
Discovery - new	ALSPAC (Children / Mothers)	Avon Longitudinal Study of Parents and Children	9315	1.00	-	12.7 (1.1) / 12.8 (1.5)	-	Illumina HumanHap 550 quad / Illumina human660W-quad	MACH	GEMMA	How old were you / was your daughter when she had her first period?
Discovery - new	Lifelines	The Life Lines Cohort Study and Biobank	7483	1.05	47.74(10.9)	13.1(1.5)	1961	Illumina CytoSNP v 2.0- 300K.	Beagle 3.3	Plink-module dosage	How old were you when you had your first menstrual period?
Discovery - new	Twingene	TwinGene	4922	1.03	64.52 (8.2)	13.5 (1.4)	-	Illumina OmniExpress bead chip	IMPUTE	est	How old you were when you got your first menstruation?
Discovery - new	EGCUT_omni	Estonian Genome Center, University of Tartu	3570	1.03	52.8(21.2)	13.7(1.4)	1955	Illumina HumanOmniExpress	IMPUTE	SNPTEST	How old were you at the time your menstruations started?
Discovery - new	B58C	British 1958 birth cohort	2480	1.02	45.2 (0.4)	12.8 (1.3)	1958	Illumina HumanHap 550K / 610K (3 deposits)	MACH	ProbABEL	Age 16, parental reply to question about cohort member: "At what age did she have her first menstrual period"
Discovery - new	GOYA_cases	Genomics in Obesity in Young Adults - case sample	1782	1.00	29 (4.3)	12.8 (1.33)	1970	Illumina Hap610Quad	MACH 1.0	ProABEL-0.2.0	How old were you when you had your first menstrual period?
Discovery - new	GOYA_ctrls	Genomics in Obesity in Young Adults - control sample	1746	1.01	29 (4.3)	13.3 (1.29)	1970	Illumina Hap610Quad	MACH 1.0	ProABEL-0.2.0	How old were you when you had your first menstrual period?
Discovery - new	NHS_KS		1685	1.00	52.6(6.6)	12.5 (1.4)	1936	Illumina Human610-Quadv1	MACH	ProABEL	At what age did your menstrual periods begin?
Discovery - new	NHS2_KS		1685	1.00	37.0(4.6)	12.4 (1.4)	1953	Illumina Human610K	MACH	ProABEL	At what age did your menstrual periods begin?
Discovery - new	EGCUT_370k	Estonian Genome Center, University of Tartu	1177	1.02	40.4(15.6)	13.3 (1.4)	1968	Illumina Human370CNV	IMPUTE	SNPTEST	How old were you at the time your menstruations started?
Discovery - new	NHS_CC	Nurses' Health Study	1168	1.00	58.0(6.6)	12.6 (1.4)	1929	Illumina Infinium Omni Express	MACH	ProABEL	At what age did your menstrual periods begin?
Discovery - new	NHS_CHD	Nurses' Health Study	1146	1.00	58.4(6.3)	12.6 (1.4)	1930	Affymetrix 6.0	MACH	ProABEL	At what age did your menstrual periods begin?
Discovery - new	KORA S4	Cooperative Health Research in the Region of Augsburg	898	1.01	55.0 (8.8)	13.5 (1.5)	1946	Affymetrix 6.0	IMPUTE	QUICKTEST	"At what age did you have the first menstrual period (menarche)?"
Discovery - new	KORA S3	Cooperative Health Research in the Region of Augsburg	809	1.01	52.8 (10.1)	13.7 (1.5)	1942	Affymetrix 500K	IMPUTE	QUICKTEST	"At what age did you have the first menstrual period (menarche)?"
Discovery - new	NHS_GA	Nurses' Health Study	804	1.01	57.4(6.2)	12.6 (1.4)	1931	Illumina Human660W_Quad_v1_A	MACH	ProABEL	At what age did your menstrual periods begin?
Discovery - new	NHS_MD	Nurses' Health Study	794	1.00	55.8(6.5)	12.5 (1.3)	1932	Illumina Infinium Omni Express	MACH	ProABEL	At what age did your menstrual periods begin?
Discovery - new	NHS_EC	Nurses' Health Study	744	0.99	55.4(6.9)	12.5(1.4)	1933	Illumina Infinium Omni Express	MACH	ProABEL	At what age did your menstrual periods begin?
Discovery - new	CAHRES_cases	Cancer Hormone Replacement Epidemiology in Sweden - cases	724	1.00	78.75 (6.3)	13.5(1.4)	-	SNPIllumina HumanHap500	IMPUTE	PLINK/ quicktest	How old were you when you had your first menstruation?
Discovery - new	NHS_GO	Nurses' Health Study	711	1.01	55.8(6.3)	12.5(1.4)	1932	Illumina Infinium Omni Express	MACH	ProABEL	At what age did your menstrual periods begin?
Discovery - new	CAHRES_ctrls	Cancer Hormone Replacement Epidemiology in Sweden - controls	677	0.99	79.08 (6.4)	13.6 (1.4)	-	SNPIllumina HumanHap500	IMPUTE	PLINK/ quicktest	How old were you when you had your first menstruation?
Discovery - new	INGI-FVG	Italian Network on Genetic Isolates - Friuli Venezia Giulia	679	1.03	50.6 (16.7)	13.1 (1.6)	-	Illumina Infinium 370	MACH	ProABEL	How old were you when you had your first menstrual period?
Discovery - new	TRAILS-Pop	Tracking Adolescents' Individual Lives Survey - Population cohort	671	1.00	16.2 (0.7)	12.8 (1.2)	1990	Illumina CytoSNP12 v2	IMPUTE2	SNPTEST	How old were you when you had your first menstrual period (... years)? How old were you when you had your first menstrual period (and ... months)?
Discovery - new	Raine	Western Australian Pregnancy (Raine) Study	614	1.01	22.77 (0.7)	12.8 (1.1)	1990	Illumina 660 Quad	MACH	skatMeta/ probABEL	Primary care giver recorded dates and duration of first three menses and returned to study coordinator.
Discovery - new	SHIP-TREND	Study of Health in Pomerania - TREND	543	1.00	50.1 (13.2)	13.3 (1.5)	1959	Illumina Human Omni 2.5	IMPUTE	QUICKTEST	At what age did your menstrual periods begin?
Discovery - new	INGI_Carlantino	Italian Network on Genetic Isolates - Carlantino	314	1.03	47.2 (17.2)	12.9 (1.6)	-	Illumina Infinium 370	MACH	ProABEL	How old were you when you had your first menstrual period?
Discovery - new	NHS2_BRCA	Nurses' Health Study	298	1.01	38.0(4.1)	12.4(1.4)	1952	Illumina Humanmap 610K			At what age did your menstrual periods begin?
Discovery - new	IUBC		227	1.04	50.8 (12.9)	12.5 (1.4)	1958	Illumina HumanOmni2.5-8v1_A	MACH 1.0.18	ProbABEL 0.1	"How old were you when you had your first menstrual period? ____ years old"
Discovery - new	TRAILS_CC	Tracking Adolescents' Individual Lives Survey	95	0.967	15.8 (0.6)	12.7 (1.2)	1994	Illumina CytoSNP12 v2	IMPUTE2	SNPTEST	How old were you when you had your first menstrual period (... years)? How old were you when you had your first menstrual period (and ... months)?

Supplementary Table 1 (continued) | Details of the 58 studies that contributed to the discovery phase for age at menarche.

Type[a]	Study Name / acronym	Full Study name	N	GC Factor	Mean age (SD)	Mean AAM (SD)	Mean birth year	SNP array	Imputation program	Analysis program	Specific Menarche question
Discovery-iCOGs	***BCAC Cases:***	***Breast Cancer Association Consortium (cases):***	27645	1.06				Illumina iSelect "iCOGS"	IMPUTEv2	In House	
Discovery-iCOGs	ABCS	Amsterdam Breast Cancer Study	507		45.8 (6.7)	13.1 (1.4)	1964	Illumina iSelect "iCOGS"			At what age did you have your first period?
Discovery-iCOGs	BBCC	Bavarian Breast Cancer Cases	525		60.3 (12.1)	13.4 (1.5)	1947	Illumina iSelect "iCOGS"			At what age you had your first menstrual period?
Discovery-iCOGs	BBCS	British Breast Cancer Study	204		55.6 (8.8)	12.6 (1.5)	1949	Illumina iSelect "iCOGS"			How old were you when your periods began?
Discovery-iCOGs	CECILE	CECILE Breast Cancer Study	1002		54.4 (10.6)	12.9 (1.6)	1951	Illumina iSelect "iCOGS"			What year did you have your first period?
Discovery-iCOGs	CGPS	Copenhagen General Population Study	1625		61.3 (12.3)	13.5 (1.4)	1943	Illumina iSelect "iCOGS"			At what age did you have your first menstruation?__years old
Discovery-iCOGs	CNIO-BCS	Spanish National Cancer Centre Breast Cancer Study	108		54.7 (12.1)	12.8 (1.4)	1951	Illumina iSelect "iCOGS"			At what age did you have your first period?
Discovery-iCOGs	CTS	California Teachers Study	50		55.7 (8.1)	12.5 (1.4)	1939	Illumina iSelect "iCOGS"			At what age did you have your first period?
Discovery-iCOGs	ESTHER	ESTHER Breast Cancer Study	130		56.1 (12.1)	13.4 (1.6)	1941	Illumina iSelect "iCOGS"			At what age did your regular bleeding began?
Discovery-iCOGs	GENICA	Gene Environment Interaction and Breast Cancer in Germany	458		57.0 (10.9)	13.3 (1.5)	1945	Illumina iSelect "iCOGS"			At what age did the first menstrual period (menarche)?
Discovery-iCOGs	HEBCS	Helsinki Breast Cancer Study	361		57.4 (12.1)	13.2 (1.5)	1943	Illumina iSelect "iCOGS"			At what age did your periods start?
Discovery-iCOGs	KARBAC	Karolinska Breast Cancer Study	356		60.2 (11.8)	13.4 (1.4)	1938	Illumina iSelect "iCOGS"			At what age did you have your first period?
Discovery-iCOGs	KBCP	Kuopio Breast Cancer Project	402		58.4 (14.0)	13.7 (1.5)	1934	Illumina iSelect "iCOGS"			At what age did you have your first periods?
Discovery-iCOGs	kConFab/AOCS	Kathleen Cuningham Foundation Consortium for research into Familial Breast Cancer/Australian Ovarian Cancer Study	575		53.5 (10.9)	13.0 (1.4)	1950	Illumina iSelect "iCOGS"			Age at first menstrual period:
Discovery-iCOGs	LMBC	Leuven Multidisciplinary Breast Centre	1797		56.8 (12.1)	13.3 (1.5)	1950	Illumina iSelect "iCOGS"			Age of menarche
Discovery-iCOGs	MARIE	Mammary Carcinoma Risk Factor Investigation	1581		62.3 (6.2)	13.5 (1.6)	1941	Illumina iSelect "iCOGS"			How old were you at the time of your first period?
Discovery-iCOGs	MBCSG	Milan Breast Cancer Study Group	177		45.4 (11.8)	12.4 (1.5)	1960	Illumina iSelect "iCOGS"			Age at first menstruation
Discovery-iCOGs	MCBCS	Mayo Clinic Breast Cancer Study	1653		57.2 (12.4)	12.7 (1.4)	1948	Illumina iSelect "iCOGS"			How old were you when you had your first menstrual period?
Discovery-iCOGs	MCCS	Melbourne Collaborative Cohort Study	608		56.7 (8.1)	13.1 (1.5)	1936	Illumina iSelect "iCOGS"			How old were you when you had your first menstrualperiod?
Discovery-iCOGs	OBCS	Oulu Breast Cancer Study	412		56.2 (11.5)	13.4 (1.5)	1947	Illumina iSelect "iCOGS"			At what age did you have your first period?
Discovery-iCOGs	OFBCR	Ontario Familial Breast Cancer Registry	985		56.8 (10.3)	12.6 (1.4)	1942	Illumina iSelect "iCOGS"			At what age did you have your first menstrual period?
Discovery-iCOGs	ORIGO	Leiden University Medical Centre Breast Cancer Study	266		57.2 (10.8)	13.2 (1.6)	1944	Illumina iSelect "iCOGS"			At what age did you have your first period?
Discovery-iCOGs	PBCS	NCI Polish Breast Cancer Study	506		56.4 (10.0)	13.5 (1.6)	1945	Illumina iSelect "iCOGS"			At what age did you have your first menstrual period?
Discovery-iCOGs	pKARMA	Karolinska Mammography Project for Risk Prediction of Breast Cancer - prevalent cases	5273		62.9 (9.8)	13.2 (1.4)	1946	Illumina iSelect "iCOGS"			At what age did you have your first menstruation?
Discovery-iCOGs	RBCS	Rotterdam Breast Cancer Study	175		41.9 (8.5)	13.0 (1.5)	1953	Illumina iSelect "iCOGS"			At what age did you first menstruate?
Discovery-iCOGs	SASBAC	Singapore and Sweden Breast Cancer Study	1059		63.4 (6.5)	13.5 (1.4)	1931	Illumina iSelect "iCOGS"			How old were you...at menarche?
Discovery-iCOGs	SBCS	Sheffield Breast Cancer Study	820		62.8 (11.9)	13.0 (1.6)	1937	Illumina iSelect "iCOGS"			Age at menarche
Discovery-iCOGs	SEARCH	Study of Epidemiology and Risk factors in Cancer Heredity	5928		55.4 (8.9)	12.8 (1.5)	1946	Illumina iSelect "iCOGS"			How old were you when you had your first menstrual period?
Discovery-iCOGs	SKKDKFZS	Städtisches Klinikum Karlsruhe Deutsches Krebsforschungszentrum Study	102		58.0 (12.8)	13.7 (1.4)	1943	Illumina iSelect "iCOGS"			How old were you when you had your first menstrual period?

Supplementary Table 1 (continued) | Details of the 58 studies that contributed to the discovery phase for age at menarche.

Type[a]	Study Name / acronym	Full Study name	N	GC Factor	Mean age (SD)	Mean AAM (SD)	Mean birth year	SNP array	Imputation program	Analysis program	Specific Menarche question
Discovery-iCOGs	***BCAC Controls:***	***Breast Cancer Association Consortium (controls):***	21003	1.06				Illumina iSelect "iCOGS"	IMPUTEv2	In House	
Discovery-iCOGs	ABCFS	Australian Breast Cancer Family Study	549		41.9 (9.3)	12.9 (1.6)	1954	Illumina iSelect "iCOGS"			Age at first menstrual period: _____ years
Discovery-iCOGs	ABCS	Amsterdam Breast Cancer Study	1159		47.7 (12.2)	13.0 (1.4)	1962	Illumina iSelect "iCOGS"			At what age did you have your first period?
Discovery-iCOGs	BBCC	Bavarian Breast Cancer Controls	371		57.5 (10.9)	13.4 (1.4)	1951	Illumina iSelect "iCOGS"			At what age you had your first menstrual period?
Discovery-iCOGs	BBCS	British Breast Cancer Study	210		51.5 (12.0)	12.8 (1.4)	1953	Illumina iSelect "iCOGS"			How old were you when your periods began?
Discovery-iCOGs	CECILE	CECILE Breast Cancer Study	978		54.6 (11.0)	13.0 (1.6)	1951	Illumina iSelect "iCOGS"			What year did you have your first period?
Discovery-iCOGs	CTS	California Teachers Study	44		55.6 (9.5)	12.5 (1.2)	1939	Illumina iSelect "iCOGS"			At what age did you have your first period?
Discovery-iCOGs	GENICA	Gene Environment Interaction and Breast Cancer in Germany	415		57.1 (11.8)	13.6 (1.6)	1945	Illumina iSelect "iCOGS"			At what age did the first menstrual period (menarche)?
Discovery-iCOGs	KBCP	Kuopio Breast Cancer Project	241		52.6 (11.5)	13.6 (1.4)	1940	Illumina iSelect "iCOGS"			At what age did you have your first periods?
Discovery-iCOGs	kConFab/AOCS	Kathleen Cuningham Foundation Consortium for research into Familial Breast Cancer/Australian Ovarian Cancer Study	486		61.7 (8.8)	13.1 (1.5)	1944	Illumina iSelect "iCOGS"			Age at first menstrual period:
Discovery-iCOGs	MARIE	Mammary Carcinoma Risk Factor Investigation	1474		61.6 (6.1)	13.5 (1.6)	1941	Illumina iSelect "iCOGS"			How old were you at the time of your first period?
Discovery-iCOGs	MCBCS	Mayo Clinic Breast Cancer Study	1679		56.3 (14.0)	12.8 (1.3)	1950	Illumina iSelect "iCOGS"			How old were you when you had your first menstrual period?
Discovery-iCOGs	MCCS	Melbourne Collaborative Cohort Study	508		56.3 (8.3)	12.9 (1.5)	1937	Illumina iSelect "iCOGS"			How old were you when you had your first menstrualperiod?
Discovery-iCOGs	OFBCR	Ontario Familial Breast Cancer Registry	501		52.0 (9.2)	12.6 (1.6)	1947	Illumina iSelect "iCOGS"			At what age did you have your first menstrual period?
Discovery-iCOGs	PBCS	NCI Polish Breast Cancer Study	409		56.2 (9.9)	13.6 (1.6)	1945	Illumina iSelect "iCOGS"			At what age did you have your first menstrual period?
Discovery-iCOGs	pKARMA	Karolinska Mammography Project for Risk Prediction of Breast Cancer - prevalent cases	5337		53.9 (9.5)	13.1 (1.4)	1957	Illumina iSelect "iCOGS"			At what age did you have your first menstruation?
Discovery-iCOGs	SASBAC	Singapore and Sweden Breast Cancer Study	1251		63.2 (6.4)	13.5 (1.4)	1931	Illumina iSelect "iCOGS"			How old were you...at menarche?
Discovery-iCOGs	SBCS	Sheffield Breast Cancer Study	835		57.5 (5.7)	13.0 (1.7)	1943	Illumina iSelect "iCOGS"			Age at menarche
Discovery-iCOGs	SEARCH	Study of Epidemiology and Risk factors in Cancer Heredity	4556		59.5 (8.2)	12.9 (1.6)	1939	Illumina iSelect "iCOGS"			How old were you when you had your first menstrual period?
Replication	InterAct	EPIC-InterAct	8869	n/a	53.7 (8.7)	13.1 (1.6)	1941	Illumina Human660W-Quad BeadChip / Illumina HumanCoreExome	IMPUTE	GCTA (LMM)	How old were you when you had your first menstrual period?

*Discovery-previous refers to studies contributing to the last ReproGen GWAS meta-analysis for age at menarche (Elks et al Nat Genet 2010 Dec;42(12):1077-8), Discovery-new refers to additional studies contributing to GWAS meta-analysis, Discovery iCOGS refers to studies genotyped with the Illumina iSelect "iCOGS" array. GC factor: genomic control factor. AAM: Age at menarche

Supplementary Table 2 | Results of GCTA analyses to identify secondary signals at menarche loci.

					Univariant Model		Joint model			
Locus	SNP	Location	N	Alleles/Freq	Beta (se)	P-value	Beta (se)	P-value	Gene	Comparison with univariant analysis
1	rs2819334	1-43787322	179,579	t/c/0.63	0.03 (0.005)	3.16E-09	0.03 (0.005)	2.52E-09	KDM4A[NC], PTPRF[EC]	Proxy (r^2=0.762) of lead univariant SNP
3	rs3101336	1-72523773	182,404	t/c/0.39	0.04 (0.005)	5.23E-13	0.03 (0.005)	1.10E-11	NEGR1[NC]	Lead univariant SNP
4	rs2344508	1-74772301	179,633	a/g/0.56	0.04 (0.005)	2.01E-16	0.04 (0.005)	2.65E-15	TNNI3K[N], TYW3[E]	Proxy (r^2=0.966) of lead univariant SNP
5	rs11165924	1-98148036	174,006	a/g/0.68	0.03 (0.006)	2.17E-09	0.03 (0.006)	1.77E-09	DPYD[N]	Lead univariant SNP
7	rs466639	1-163661506	179,432	c/t/0.87	0.08 (0.007)	2.38E-24	0.08 (0.007)	1.99E-24	RXRG[NC]	Lead univariant SNP
8	rs543874	1-176156103	179,613	a/g/0.8	0.05 (0.006)	1.40E-15	0.05 (0.006)	1.10E-15	SEC16B[N]	Lead univariant SNP
9	rs4915387	1-198054424	175,771	a/g/0.51	0.03 (0.005)	4.96E-08	0.03 (0.005)	3.16E-08	NR5A2[NC]	Proxy (r^2=0.967) of lead univariant SNP
10	rs951366	1-203951975	179,567	t/c/0.6	0.03 (0.005)	1.75E-08	0.03 (0.005)	1.50E-08	NUCKS1[NE], RAB7L1[E]	Lead univariant SNP
11	rs2947411	2-604168	179,608	a/g/0.17	0.06 (0.007)	1.81E-19	0.06 (0.007)	1.74E-19	TMEM18[NC]	Lead univariant SNP
12	rs6747380	2-56441253	182,377	a/g/0.17	0.07 (0.007)	5.55E-28	0.07 (0.007)	2.83E-28	CCDC85A[N]	Lead univariant SNP
14	rs6758290	2-105231258	167,496	t/c/0.51	0.04 (0.005)	6.58E-13	0.04 (0.005)	1.14E-12	GPR45[N]	Lead univariant SNP
15	rs12472911	2-141944979	182,269	c/t/0.21	0.04 (0.006)	6.70E-10	0.04 (0.006)	7.48E-10	LRP1B[N]	Lead univariant SNP
16a	rs17236969	2-156460705	162,496	t/c/0.14	0.05 (0.008)	2.59E-09	0.05 (0.008)	1.00E-08	NR4A2[NC]	
16b	rs4369815	2-156835210	174,922	t/g/0.93	0.06 (0.01)	1.50E-10	0.06 (0.01)	5.48E-10	NR4A2[NC]	Lead univariant SNP
17a	rs1400974	2-199346935	179,605	a/g/0.64	0.05 (0.005)	8.34E-20	0.04 (0.005)	3.04E-17	SATB2[N]	Lead univariant SNP
17b	rs17233066	2-199352283	168,273	c/t/0.93	0.09 (0.014)	6.12E-11	0.08 (0.014)	1.82E-09	SATB2[N]	
17c	rs17266097	2-199983454	179,181	t/c/0.42	0.04 (0.005)	3.26E-18	0.04 (0.005)	2.37E-16	SATB2[N]	
18	rs6770162	3-24686017	179,304	a/g/0.51	0.04 (0.005)	1.50E-12	0.04 (0.005)	1.09E-12	THRB[NC]	Lead univariant SNP
19a	rs7647973	3-49485935	179,667	a/g/0.26	0.05 (0.006)	1.29E-16	0.05 (0.006)	2.41E-16	WDR6[EC], UBA7[C]	Proxy (r^2=1) of lead univariant SNP
19b	rs6762477	3-50068213	138,679	g/a/0.44	0.04 (0.006)	7.83E-12	0.04 (0.006)	2.19E-11	WDR6[EC], UBA7[C]	
20	rs7642134	3-86999572	182,263	g/a/0.61	0.04 (0.005)	3.01E-16	0.04 (0.005)	1.74E-16	POU1F1[C] (PIT1)	Lead univariant SNP
22	rs11715566	3-119045126	179,637	t/c/0.5	0.05 (0.005)	2.42E-27	0.05 (0.005)	1.98E-27	IGSF11[N~1Mb]	Lead univariant SNP
23	rs2687729	3-129377916	179,617	g/a/0.27	0.04 (0.006)	1.04E-10	0.04 (0.006)	4.38E-12	EEFSEC[NE]	Lead univariant SNP
24	rs2600959	3-134098154	174,583	a/g/0.34	0.04 (0.005)	4.11E-11	0.04 (0.005)	4.23E-11	ACAD11[E]	Lead univariant SNP
25	rs13067731	3-138472681	179,330	t/c/0.16	0.04 (0.007)	1.04E-09	0.04 (0.007)	1.49E-09	IL20RB[N]	Lead univariant SNP
26	rs1482853	3-158281167	179,650	c/a/0.6	0.03 (0.005)	3.00E-11	0.03 (0.005)	2.63E-11	LEKR1[NE], CCNL1[C]	Proxy (r^2=0.965) of lead univariant SNP
27	rs939317	3-185528493	179,622	g/a/0.74	0.04 (0.006)	3.02E-12	0.04 (0.006)	1.10E-12	EIF4G1[N]	Lead univariant SNP
28	rs16860328	3-187118379	179,646	g/a/0.42	0.04 (0.005)	1.38E-16	0.04 (0.005)	9.57E-17	TRA2B[N], IGF2BP2[C]	Lead univariant SNP
29	rs1038903	4-28361152	179,610	t/c/0.73	0.04 (0.006)	1.96E-11	0.04 (0.006)	2.23E-11	PCDH7[N~2Mb]	Lead univariant SNP
30	rs10938397	4-44877284	179,167	a/g/0.57	0.04 (0.005)	3.98E-13	0.04 (0.005)	3.36E-13	GNPDA2[N]	Lead univariant SNP
31	rs8026	4-95431208	138,666	g/a/0.4	0.04 (0.006)	1.13E-10	0.04 (0.006)	8.71E-11	SMARCAD1[NEF]	Proxy (r^2=1) of lead univariant SNP
32	rs3775971	4-104861369	179,608	c/t/0.15	0.05 (0.007)	5.71E-13	0.05 (0.007)	5.97E-13	TACR3[NC]	Proxy (r^2=1) of lead univariant SNP
33	rs1532331	5-43152587	179,201	g/t/0.32	0.03 (0.005)	3.53E-09	0.03 (0.005)	3.49E-09	ZNF131[NEC], GHR[C]	Lead univariant SNP
34	rs17086188	5-95871610	176,967	a/g/0.95	0.07 (0.013)	3.58E-08	0.07 (0.013)	3.57E-08	PCSK1[NC]	Lead univariant SNP
35	rs251130	5-110887696	179,429	g/a/0.73	0.04 (0.006)	2.76E-10	0.04 (0.006)	2.07E-10	STARD4[NEC]	Lead univariant SNP
36	rs13179411	5-133928412	179,579	t/g/0.17	0.06 (0.007)	3.44E-20	0.06 (0.007)	5.02E-20	PHF15[N], TCF7[E]	Lead univariant SNP
37	rs740077	5-137787982	179,600	a/c/0.78	0.04 (0.006)	1.10E-13	0.05 (0.006)	6.26E-14	KDM3B[NC], BRD8[C]	Proxy (r^2=1) of lead univariant SNP
38	rs7701886	5-153527602	179,664	a/g/0.57	0.03 (0.005)	4.51E-08	0.03 (0.005)	4.03E-08	GALNT10[N]	Lead univariant SNP
39	rs9647570	5-167302841	179,600	g/t/0.14	0.05 (0.007)	1.37E-11	0.05 (0.007)	5.88E-13	TENM2[NC]	Lead univariant SNP
40	rs6555855	5-168682315	179,462	g/a/0.23	0.04 (0.006)	2.40E-09	0.04 (0.006)	9.35E-11	SLIT3[N]	Lead univariant SNP
41	rs16896742	6-30030719	171,665	g/a/0.38	0.04 (0.006)	3.19E-10	0.04 (0.006)	4.13E-10	HLA-A[N]	Lead univariant SNP
42	rs2479724	6-41998960	179,630	t/c/0.45	0.03 (0.005)	1.17E-12	0.03 (0.005)	6.65E-13	BYSL[NE], FRS3[C]	Lead univariant SNP
43	rs1393776	6-54870977	179,578	g/t/0.65	0.04 (0.005)	2.06E-12	0.04 (0.005)	2.07E-12	FAM83B[N], HCRTR2[C]	Proxy (r^2=1) of lead univariant SNP
44	rs9475752	6-56888700	178,646	c/t/0.8	0.04 (0.006)	8.28E-12	0.04 (0.006)	9.05E-12	DST[N], BEND6[E]	Lead univariant SNP
45	rs9447700	6-77224806	179,648	c/t/0.7	0.03 (0.005)	5.55E-09	0.03 (0.005)	4.96E-09	IMPG1[N]	Lead univariant SNP
46a	rs9321659	6-100222813	182,356	a/g/0.13	0.06 (0.008)	2.50E-16	0.06 (0.008)	2.94E-16	SIM1[C], MCHR2[C]	Lead univariant SNP
46b	rs4840086	6-100315159	179,666	a/g/0.58	0.04 (0.005)	9.23E-14	0.04 (0.005)	4.28E-13	SIM1[C], MCHR2[C]	
46c	rs13196561	6-100866891	182,278	c/a/0.78	0.04 (0.006)	8.38E-12	0.06 (0.006)	3.42E-20	SIM1[NC], MCHR2[C]	
46d	rs239198	6-101240798	179,496	t/c/0.46	0.03 (0.005)	2.47E-08	0.04 (0.005)	3.10E-15	SIM1[C], ASCC3[NEF]	
47a	rs4946632	6-105207901	132,973	t/c/0.9	-0.01 (0.01)	1.41E-01	0.07 (0.01)	3.11E-12	LIN28B[C]	
47b	rs2153127	6-105455237	182,110	t/c/0.53	0.08 (0.005)	5.49E-59	0.03 (0.006)	2.13E-09	LIN28B[EC]	
47c	rs7759938	6-105485647	179,557	c/t/0.32	0.12 (0.005)	7.83E-110	0.11 (0.006)	1.23E-69	LIN28B[NC]	Lead univariant SNP
48	rs4895808	6-126823127	179,655	c/t/0.54	0.03 (0.005)	4.85E-13	0.03 (0.005)	2.48E-12	CENPW[NE], NCOA7[C]	Lead univariant SNP
49	rs6938574	6-128432673	178,428	t/c/0.16	0.04 (0.007)	2.39E-09	0.04 (0.007)	1.54E-08	PTPRK[N]	Lead univariant SNP
50	rs6933660	6-151845447	182,379	c/a/0.69	0.03 (0.005)	1.29E-09	0.03 (0.005)	1.24E-09	ESR1[C]	Lead univariant SNP
51	rs4141153	7-41434471	174,917	g/a/0.21	0.06 (0.006)	9.81E-20	0.06 (0.006)	9.49E-20	INHBA[NC]	Proxy (r^2=0.615) of lead univariant SNP
52	rs4717903	7-73706103	174,242	t/c/0.75	0.04 (0.006)	6.03E-12	0.04 (0.006)	4.75E-12	GTF2I[NC]	Proxy (r^2=0.872) of lead univariant SNP
53	rs11767400	7-121947978	179,658	a/c/0.29	0.04 (0.006)	4.10E-11	0.04 (0.006)	5.96E-11	CADPS2[N]	Lead univariant SNP
54a	rs2688325	8-3754618	182,244	t/c/0.29	0.03 (0.006)	2.07E-09	0.03 (0.006)	9.72E-10	CSMD1[N]	
54b	rs7828501	8-4547489	179,434	g/a/0.45	0.04 (0.005)	1.20E-13	0.04 (0.005)	2.78E-15	CSMD1[N]	Lead univariant SNP
54c	rs7463166	8-4821198	179,542	a/g/0.64	0.03 (0.005)	1.31E-08	0.03 (0.005)	5.85E-09	CSMD1[N]	
55	rs16918254	8-53931766	179,635	a/g/0.92	0.05 (0.009)	1.42E-08	0.05 (0.009)	1.43E-08	NPBWR1[NC]	Lead univariant SNP
56	rs7821178	8-78256392	179,533	c/a/0.66	0.04 (0.005)	7.26E-17	0.04 (0.005)	1.04E-16	PEX2[N]	Lead univariant SNP
57	rs1469039	8-140720961	174,755	a/g/0.19	0.05 (0.007)	3.48E-12	0.05 (0.007)	3.21E-12	KCNK9[N]	Lead univariant SNP
59a	rs7037266	9-6932940	179,488	a/c/0.37	0.03 (0.005)	4.70E-09	0.03 (0.005)	3.46E-09	KDM4C[NC]	
59b	rs913588	9-7164673	182,403	g/a/0.49	0.03 (0.005)	5.83E-11	0.03 (0.005)	3.84E-11	KDM4C[NFC]	Lead univariant SNP
60	rs7865468	9-10264080	179,418	a/g/0.7	0.03 (0.005)	1.34E-07	0.03 (0.005)	1.86E-08	PTPRD[N]	
61	rs7853970	9-85905386	169,702	t/c/0.47	0.03 (0.005)	2.29E-09	0.03 (0.005)	3.12E-09	RMI1[N], NTRK2[C]	Lead univariant SNP
62a	rs10816359	9-107797491	169,277	t/g/0.86	0.04 (0.008)	1.58E-08	0.05 (0.008)	1.16E-12	TMEM38B[N]	
62b	rs10453225	9-107960041	179,631	g/t/0.68	0.09 (0.005)	5.78E-66	0.07 (0.006)	3.52E-33	TMEM38B[N]	Proxy (r^2=0.813) of lead univariant SNP
62c	rs10739221	9-108100651	179,624	c/t/0.77	0.08 (0.006)	3.95E-41	0.05 (0.007)	1.92E-11	TMEM38B[N]	

Supplementary Table 2 (continued) | Results of GCTA analyses to identify secondary signals at menarche loci.

					Univariant Model		Joint model			
Locus	SNP	Location	N	Alleles/Freq	Beta (se)	P-value	Beta (se)	P-value	Gene	Comparison with univariant analysis
63	rs11792861	9-110849116	179,618	a/c/0.7	0.04 (0.005)	1.68E-11	0.03 (0.005)	3.58E-09	TMEM245[NE]	Lead univariant SNP
64a	rs10980854	9-113090178	181,999	a/g/0.07	0.06 (0.011)	1.29E-08	0.06 (0.011)	4.27E-09	ZNF483 / OR2K2[N]	
64b	rs10980921	9-113319733	172,160	c/t/0.09	0.09 (0.009)	1.72E-23	0.09 (0.009)	4.27E-23	ZNF483 / OR2K2[N]	Proxy (r^2=1) of lead univariant SNP
65	rs7896371	10-1719026	174,903	t/c/0.46	0.04 (0.005)	3.04E-12	0.04 (0.005)	2.96E-12	ADARB2[N]	Proxy (r^2=0.809) of lead univariant SNP
66	rs12571664	10-121698919	179,629	t/c/0.79	0.04 (0.006)	3.28E-10	0.04 (0.006)	1.59E-10	SEC23IP[NE]	Lead univariant SNP
67	rs1915146	10-126836204	182,401	g/a/0.41	0.03 (0.005)	3.72E-08	0.03 (0.005)	1.79E-08	CTBP2[NC]	Lead univariant SNP
68	rs6598060	11-233987	179,642	g/a/0.25	0.03 (0.006)	3.73E-08	0.03 (0.006)	1.45E-08	SIRT3[NEC]	Proxy (r^2=1) of lead univariant SNP
69	rs4929923	11-8595776	179,343	t/c/0.36	0.04 (0.005)	2.73E-12	0.04 (0.005)	5.80E-13	TRIM66[NEF]	Proxy (r^2=1) of lead univariant SNP
70	rs7951393	11-13275007	179,372	c/t/0.29	0.05 (0.006)	1.87E-19	0.05 (0.006)	5.93E-20	ARNTL[N], PTH[C]	Proxy (r^2=0.735) of lead univariant SNP
71	rs2030323	11-27685115	179,632	a/c/0.21	0.04 (0.006)	2.68E-11	0.04 (0.006)	2.83E-11	BDNF[NC], LGR4[C]	Proxy (r^2=1) of lead univariant SNP
73	rs2959104	11-46021612	179,516	a/g/0.92	0.07 (0.009)	4.57E-13	0.07 (0.009)	5.34E-13	PHF21A[N]	Proxy (r^2=0.649) of lead univariant SNP
74	rs2063730	11-77726172	179,293	c/a/0.18	0.05 (0.007)	2.28E-12	0.05 (0.007)	3.19E-12	GAB2[N], THRSP[C]	Lead univariant SNP
75	rs10895140	11-100941931	179,647	g/a/0.66	0.04 (0.005)	6.71E-14	0.04 (0.005)	3.81E-14	TRPC6[N], PGR[C]	Lead univariant SNP
76	rs11215400	11-114557845	179,376	c/a/0.26	0.04 (0.006)	6.78E-11	0.04 (0.006)	8.84E-11	CADM1[N]	Lead univariant SNP
77	rs1461503	11-122350285	179,603	c/a/0.57	0.05 (0.005)	2.71E-26	0.05 (0.005)	5.17E-26	BSX[NC]	Lead univariant SNP
78	rs7955374	12-46166416	179,419	t/c/0.13	0.04 (0.008)	9.49E-09	0.04 (0.008)	7.12E-09	VDR[C]	Lead univariant SNP
79	rs7138803	12-48533735	174,834	g/a/0.62	0.04 (0.005)	1.70E-12	0.04 (0.005)	8.16E-13	BCDIN3D[N]	Lead univariant SNP
80	rs6563739	13-39137785	179,667	g/t/0.34	0.03 (0.005)	2.29E-11	0.03 (0.005)	1.76E-11	COG6[NE]	Lead univariant SNP
81	rs9565072	13-73537800	179,608	c/t/0.66	0.03 (0.005)	3.97E-10	0.03 (0.005)	2.74E-10	KLF12[N]	Proxy (r^2=1) of lead univariant SNP
82	rs9560113	13-110981349	179,359	g/a/0.28	0.05 (0.006)	2.10E-17	0.05 (0.006)	1.52E-17	TEX29	Lead univariant SNP
83	rs1254331	14-59985990	179,639	g/a/0.3	0.04 (0.005)	2.98E-16	0.04 (0.005)	2.29E-16	SIX6[N]	Proxy (r^2=1) of lead univariant SNP
85a	rs10144321	14-99952158	179,595	a/g/0.75	0.04 (0.006)	9.03E-15	0.04 (0.006)	1.13E-14	DLK1[C],	Lead univariant SNP
85b	rs7141210	14-100252223	172,034	t/c/0.34	0.03 (0.005)	5.84E-09	0.03 (0.005)	4.12E-09	DLK1[NEC]	
86	rs12148769	15-21703187	182,411	g/a/0.9	0.05 (0.008)	5.22E-11	0.05 (0.008)	5.19E-11	NDN[N], MKRN3[C]	Lead univariant SNP
87	rs3743266	15-58568805	182,389	t/c/0.68	0.04 (0.005)	2.35E-13	0.04 (0.005)	1.82E-13	RORA[NC]	Lead univariant SNP
88	rs8032675	15-65746518	179,630	t/c/0.4	0.04 (0.005)	2.06E-13	0.04 (0.005)	2.12E-13	MAP2K5[N]	Lead univariant SNP
89	rs12915845	15-86843471	179,535	c/t/0.58	0.03 (0.005)	2.75E-12	0.03 (0.005)	4.55E-12	DET1[NE]	Lead univariant SNP
90	rs1659127	16-14295806	177,717	a/g/0.33	0.04 (0.005)	8.97E-16	0.04 (0.005)	1.64E-15	MKL2[N]	Proxy (r^2=0.837) of lead univariant SNP
91	rs12446632	16-19842890	182,401	a/g/0.13	0.04 (0.007)	1.28E-08	0.04 (0.007)	3.09E-08	GPRC5B[NC]	Lead univariant SNP
92	rs1129700	16-29825535	181,797	t/c/0.44	0.03 (0.005)	2.34E-09	0.03 (0.005)	3.49E-09	KCTD13[N], TBX6[EC]	Lead univariant SNP
93	rs8050136	16-52373776	182,365	c/a/0.6	0.04 (0.005)	1.73E-17	0.04 (0.005)	1.48E-17	FTO[NC]	Lead univariant SNP
94a	rs1364063	16-68146073	182,393	c/t/0.43	0.05 (0.005)	6.16E-21	0.04 (0.005)	4.79E-18	COG4[C], NFAT5[N]	Lead univariant SNP
94b	rs929843	16-68603249	177,329	a/c/0.23	0.04 (0.006)	1.21E-11	0.04 (0.006)	5.90E-09	COG4[C], WWP2[N]	
95	rs7215990	17-5975555	170,053	g/a/0.76	0.04 (0.006)	1.95E-08	0.04 (0.006)	1.60E-08	WSCD1[NE], ALOX15B[E]	Lead univariant SNP
96	rs9635759	17-46968784	179,649	a/g/0.32	0.05 (0.005)	1.69E-24	0.06 (0.005)	2.12E-25	CA10[N]	Lead univariant SNP
97	rs244293	17-50585721	179,560	g/a/0.6	0.03 (0.005)	4.25E-11	0.03 (0.005)	3.18E-12	STXBP4[NE]	Lead univariant SNP
98	rs12607903	18-3807134	179,171	c/t/0.3	0.04 (0.005)	5.41E-11	0.04 (0.005)	3.84E-11	DLGAP1[N]	Lead univariant SNP
99	rs2137289	18-43006123	178,617	a/g/0.59	0.05 (0.005)	8.24E-20	0.05 (0.005)	1.60E-19	SKOR2[N]	Lead univariant SNP
100	rs652260	19-7806562	182,356	t/c/0.54	0.03 (0.005)	9.92E-09	0.03 (0.005)	2.91E-08	EVI5L[N], RETN[C]	Lead univariant SNP
101	rs889122	19-9856867	179,397	g/t/0.72	0.04 (0.006)	1.63E-13	0.04 (0.006)	6.09E-13	OLFM2[N], RDH8[C]	Lead univariant SNP
102	rs10423674	19-18678903	182,377	a/c/0.34	0.04 (0.005)	9.15E-12	0.03 (0.005)	1.00E-11	CRTC1[NC]	Lead univariant SNP
103	rs852069	20-17070593	182,413	g/a/0.64	0.04 (0.005)	1.22E-13	0.04 (0.005)	1.95E-13	PCSK2[NC]	Lead univariant SNP
104	rs2836961	21-39548890	182,373	a/c/0.61	0.03 (0.005)	8.22E-11	0.03 (0.005)	1.12E-10	BRWD1[NC]	Proxy (r^2=0.805) of lead univariant SNP
105	rs13053505	22-37575564	177,596	g/t/0.81	0.04 (0.007)	2.95E-08	0.04 (0.007)	3.81E-08	NPTXR[NE]	Lead univariant SNP

Alleles/freq refers to the menarche age increasing allele (for the univariate SNP discovery) / decreasing allele / increasing allele frequency based on the meta-analysed study estimates. Gene annotation N refers to nearest gene, C refers to candidate gene, E refers to eQTL.

Supplementary Table 3 | Follow up of 123 menarche SNPs in the EPIC-InterAct study (n=8.869 women).

								Univariate		Joint Model		InterAct Replication (N=8689)		
Signal	Locus	SNP	Location	N	Menarche raising allele	Other allele	IAF	Beta (se)	P	Beta (se)	P	Beta (per year)	SE	P
1	1	rs2274465	1-43894144	179348	c	g	0.66	0.03 (0.005)	1.7E-09	n/a	n/a	0.056	0.023	1.6E-02
2	2	rs10789181	1-65589155	177560	a	g	0.39	0.03 (0.005)	3.5E-08	n/a	n/a	-0.005	0.023	8.3E-01
3	3	rs3101336	1-72523773	182404	t	c	0.4	0.04 (0.005)	5.2E-13	n/a	n/a	0.043	0.023	6.6E-02
4	4	rs7514705	1-74779308	179631	c	t	0.56	0.04 (0.005)	1.8E-16	n/a	n/a	0.060	0.022	7.7E-03
5	5	rs11165924	1-98148036	174006	a	g	0.69	0.03 (0.006)	2.2E-09	n/a	n/a	0.027	0.024	2.6E-01
6	6	rs11578152	1-102349609	179433	g	a	0.44	0.03 (0.005)	4.5E-08	n/a	n/a	0.018	0.023	4.2E-01
7	7	rs466639	1-163661506	179432	c	t	0.87	0.08 (0.007)	2.4E-24	n/a	n/a	0.084	0.034	1.2E-02
8	8	rs543874	1-176156103	179613	a	g	0.8	0.05 (0.006)	1.4E-15	n/a	n/a	0.077	0.030	9.2E-03
9	9	rs6427782	1-198064962	175785	a	g	0.51	0.03 (0.005)	4.6E-08	n/a	n/a	-0.035	0.022	1.2E-01
10	10	rs951366	1-203951975	179567	t	c	0.6	0.03 (0.005)	1.7E-08	n/a	n/a	-0.004	0.023	8.5E-01
11	11	rs2947411	2-604168	179608	a	g	0.17	0.06 (0.007)	1.8E-19	n/a	n/a	0.046	0.029	1.1E-01
12	12	rs6747380	2-56441253	182377	a	g	0.17	0.07 (0.007)	5.6E-28	n/a	n/a	0.054	0.030	7.0E-02
13	13	rs268067	2-59734549	179406	a	g	0.8	0.04 (0.006)	3.3E-08	n/a	n/a	0.042	0.029	1.4E-01
14	14	rs6758290	2-105231258	167496	t	c	0.5	0.04 (0.005)	6.6E-13	n/a	n/a	0.015	0.022	4.9E-01
15	15	rs12472911	2-141944979	182269	c	t	0.2	0.04 (0.006)	6.7E-10	n/a	n/a	0.022	0.027	4.1E-01
16	16	rs17236969	2-156460705	162496	t	c	0.14	0.05 (0.008)	2.6E-09	0.05 (0.008)	1.0E-08	-0.001	0.031	9.6E-01
17		rs4369815	2-156835210	174922	t	g	0.93	0.06 (0.01)	1.5E-10	0.06 (0.01)	5.5E-10	0.023	0.043	6.0E-01
18	17	rs1400974	2-199346935	179605	a	g	0.64	0.05 (0.005)	8.3E-20	0.04 (0.005)	3.0E-17	0.077	0.023	8.1E-04
19		rs17233066	2-199352283	168273	c	t	0.93	0.09 (0.014)	6.1E-11	0.08 (0.014)	1.8E-09	0.027	0.051	6.0E-01
20		rs17266097	2-199983454	179181	t	c	0.42	0.04 (0.005)	3.3E-18	0.04 (0.005)	2.4E-16	0.043	0.023	6.3E-02
21	18	rs6770162	3-24686017	179304	a	g	0.51	0.04 (0.005)	1.5E-12	n/a	n/a	0.016	0.023	4.9E-01
22	19	rs7647973	3-49485935	179667	a	g	0.26	0.05 (0.006)	1.3E-16	0.05 (0.006)	2.4E-16	0.018	0.025	4.8E-01
23		rs6762477	3-50068213	138679	g	a	0.44	0.04 (0.006)	7.8E-12	0.04 (0.006)	2.2E-11	-0.004	0.022	8.7E-01
24	20	rs7642134	3-86999572	182263	g	a	0.61	0.04 (0.005)	3.0E-16	n/a	n/a	0.061	0.023	7.5E-03
25	21	rs9849248	3-88323964	179654	c	t	0.15	0.04 (0.007)	1.9E-08	n/a	n/a	0.021	0.032	5.2E-01
26	22	rs11715566	3-119045126	179637	t	c	0.5	0.05 (0.005)	2.4E-27	n/a	n/a	0.066	0.022	2.9E-03
27	23	rs2687729	3-129377916	179617	g	a	0.27	0.04 (0.006)	1.0E-10	n/a	n/a	-0.026	0.025	3.0E-01
28	24	rs2600959	3-134098154	174583	a	g	0.34	0.04 (0.005)	4.1E-11	n/a	n/a	0.030	0.023	1.9E-01
29	25	rs13067731	3-138472681	179330	t	c	0.16	0.04 (0.007)	1.0E-09	n/a	n/a	0.074	0.029	1.2E-02
30	26	rs900400	3-158281469	179649	t	c	0.61	0.03 (0.005)	2.3E-11	n/a	n/a	0.072	0.023	1.5E-03
31	27	rs939317	3-185528493	179622	g	a	0.74	0.04 (0.006)	3.0E-12	n/a	n/a	0.031	0.026	2.4E-01
32	28	rs16860328	3-187118379	179646	g	a	0.42	0.04 (0.005)	1.4E-16	n/a	n/a	0.065	0.023	4.2E-03
33	29	rs1038903	4-28361152	179610	t	c	0.73	0.04 (0.006)	2.0E-11	n/a	n/a	0.045	0.025	7.7E-02
34	30	rs10938397	4-44877284	179167	a	g	0.57	0.04 (0.005)	4.0E-13	n/a	n/a	0.040	0.023	7.4E-02
35	31	rs13135934	4-95426711	178661	c	g	0.4	0.03 (0.005)	1.1E-10	n/a	n/a	0.048	0.023	3.6E-02
36	32	rs3733631	4-104860552	179623	c	g	0.15	0.05 (0.007)	4.8E-13	n/a	n/a	0.067	0.030	2.7E-02
37	33	rs1532331	5-43152587	179201	g	t	0.32	0.03 (0.005)	3.5E-09	n/a	n/a	0.001	0.024	9.7E-01
38	34	rs17086188	5-95871610	176967	a	g	0.94	0.07 (0.013)	3.6E-08	n/a	n/a	0.019	0.065	7.7E-01
39	35	rs251130	5-110887696	179429	g	a	0.73	0.04 (0.006)	2.8E-10	n/a	n/a	-0.002	0.025	9.5E-01
40	36	rs13179411	5-133928412	179579	t	g	0.17	0.06 (0.007)	3.4E-20	n/a	n/a	-0.027	0.030	3.7E-01
41	37	rs17171818	5-137752902	182224	c	t	0.77	0.04 (0.006)	8.9E-14	n/a	n/a	0.037	0.026	1.6E-01
42	38	rs7701886	5-153527602	179664	a	g	0.58	0.03 (0.005)	4.5E-08	n/a	n/a	0.069	0.022	2.2E-03
43	39	rs9647570	5-167302841	179600	g	t	0.14	0.05 (0.007)	1.4E-11	n/a	n/a	0.084	0.034	1.3E-02
44	40	rs6555855	5-168682315	179462	g	a	0.23	0.04 (0.006)	2.4E-09	n/a	n/a	0.047	0.027	8.4E-02
45	41	rs16896742	6-30030719	171665	g	a	0.38	0.04 (0.006)	3.2E-10	n/a	n/a	-	-	-
46	42	rs2479724	6-41998960	179630	t	c	0.45	0.03 (0.005)	1.2E-12	n/a	n/a	0.048	0.022	3.3E-02
47	43	rs988913	6-54864267	182407	c	t	0.66	0.04 (0.005)	1.4E-12	n/a	n/a	0.021	0.023	3.7E-01
48	44	rs9475752	6-56888700	178646	c	t	0.81	0.04 (0.006)	8.3E-12	n/a	n/a	0.030	0.027	2.7E-01
49	45	rs9447700	6-77224806	179648	c	t	0.69	0.03 (0.005)	5.6E-09	n/a	n/a	0.042	0.025	9.2E-02
50	46	rs9321659	6-100222813	182356	a	g	0.13	0.06 (0.008)	2.5E-16	0.06 (0.008)	2.9E-16	-0.003	0.034	9.4E-01
51		rs4840086	6-100315159	179666	a	g	0.58	0.04 (0.005)	9.2E-14	0.04 (0.005)	4.3E-13	0.024	0.023	2.8E-01
52		rs13196561	6-100866891	182278	c	a	0.78	0.04 (0.006)	8.4E-12	0.06 (0.006)	3.4E-20	0.027	0.027	3.0E-01
53		rs239198	6-101240798	179496	t	c	0.46	0.03 (0.005)	2.5E-08	0.04 (0.005)	3.1E-15	0.055	0.022	1.4E-02
54	47	rs4946632	6-105207901	132973	c	t	0.1	0.01 (0.01)	0.14	-0.07 (0.01)	3.1E-12	0.076	0.038	4.8E-02
55		rs2153127	6-105455237	182110	t	c	0.52	0.08 (0.005)	5.5E-59	0.03 (0.006)	2.1E-09	0.039	0.022	7.8E-02
56		rs7759938	6-105485647	179557	c	t	0.32	0.12 (0.005)	7.8E-110	0.11 (0.006)	1.2E-69	0.054	0.024	2.5E-02
57	48	rs4895808	6-126823127	179655	c	t	0.54	0.03 (0.005)	4.8E-13	n/a	n/a	0.034	0.022	1.3E-01
58	49	rs6938574	6-128432673	178428	t	c	0.16	0.04 (0.007)	2.4E-09	n/a	n/a	0.044	0.032	1.7E-01
59	50	rs6933660	6-151845447	182379	c	a	0.69	0.03 (0.005)	1.3E-09	n/a	n/a	0.048	0.024	4.4E-02
60	51	rs1079866	7-41436618	172036	g	c	0.15	0.07 (0.007)	9.3E-24	n/a	n/a	0.100	0.033	2.4E-03

61	52	rs6964833	7-73739845	171484	t	c	0.75	0.04 (0.006)	5.3E-12	n/a	n/a	0.039	0.026	1.4E-01
62	53	rs11767400	7-121947978	179658	a	c	0.3	0.04 (0.006)	4.1E-11	n/a	n/a	0.001	0.024	9.8E-01
63	54	rs2688325	8-3754618	182244	t	c	0.29	0.03 (0.006)	2.1E-09	0.03 (0.006)	9.7E-10	0.047	0.024	5.2E-02
64		rs7828501	8-4547489	179434	g	a	0.45	0.04 (0.005)	1.2E-13	0.04 (0.005)	2.8E-15	0.054	0.023	1.6E-02
65		rs7463166	8-4821198	179542	a	g	0.63	0.03 (0.005)	1.3E-08	0.03 (0.005)	5.9E-09	0.081	0.023	4.2E-04
66	55	rs16918254	8-53931766	179635	a	g	0.92	0.05 (0.009)	1.4E-08	n/a	n/a	0.096	0.041	1.8E-02
67	56	rs7821178	8-78256392	179533	c	a	0.65	0.04 (0.005)	7.3E-17	n/a	n/a	0.034	0.023	1.5E-01
68	57	rs1469039	8-140720961	174755	a	g	0.19	0.05 (0.007)	3.5E-12	n/a	n/a	0.000	0.031	1.0E+00
69	58	rs4875053	8-144944399	136628	g	c	0.44	0.03 (0.006)	1.3E-08	n/a	n/a	0.011	0.023	6.2E-01
70	59	rs7037266	9-6932940	179488	a	c	0.37	0.03 (0.005)	4.7E-09	0.03 (0.005)	3.5E-09	0.030	0.023	2.0E-01
71		rs913588	9-7164673	182403	g	a	0.49	0.03 (0.005)	5.8E-11	0.03 (0.005)	3.8E-11	0.069	0.022	2.1E-03
72	60	rs7865468	9-10264080	179418	a	g	0.7	0.03 (0.005)	1.3E-07	0.03 (0.005)	1.9E-08	-0.017	0.024	4.6E-01
73	61	rs7853970	9-85905386	169702	t	c	0.47	0.03 (0.005)	2.3E-09	n/a	n/a	0.048	0.023	3.3E-02
74	62	rs10816359	9-107797491	169277	t	g	0.86	0.04 (0.008)	1.6E-08	0.05 (0.008)	1.2E-12	0.016	0.030	5.8E-01
75		rs10453225	9-107960041	179631	g	t	0.68	0.09 (0.005)	5.8E-66	0.07 (0.006)	3.5E-33	0.046	0.024	5.1E-02
76		rs10739221	9-108100651	179624	c	t	0.77	0.08 (0.006)	3.9E-41	0.05 (0.007)	1.9E-11	0.030	0.025	2.4E-01
77	63	rs11792861	9-110849116	179618	a	c	0.7	0.04 (0.005)	1.7E-11	n/a	n/a	0.036	0.025	1.5E-01
78	64	rs10980854	9-113090178	181999	a	g	0.06	0.06 (0.011)	1.3E-08	0.06 (0.011)	4.3E-09	0.045	0.044	3.1E-01
79		rs10980921	9-113319733	172160	c	t	0.09	0.09 (0.009)	1.7E-23	0.09 (0.009)	4.3E-23	0.116	0.039	3.3E-03
80	65	rs1874984	10-1721871	179112	c	g	0.47	0.04 (0.005)	1.9E-12	n/a	n/a	0.062	0.023	5.9E-03
81	66	rs12571664	10-121698919	179629	t	c	0.79	0.04 (0.006)	3.3E-10	n/a	n/a	0.012	0.027	6.7E-01
82	67	rs1915146	10-126836204	182401	g	a	0.4	0.03 (0.005)	3.7E-08	n/a	n/a	0.036	0.023	1.2E-01
83	68	rs7104764	11-219977	179664	g	a	0.25	0.03 (0.006)	3.7E-08	n/a	n/a	0.036	0.025	1.6E-01
84	69	rs4929947	11-8596570	179331	g	c	0.36	0.04 (0.005)	2.6E-12	n/a	n/a	0.056	0.023	1.5E-02
85	70	rs11022756	11-13272015	179401	a	c	0.29	0.05 (0.006)	7.4E-20	n/a	n/a	0.042	0.024	8.7E-02
86	71	rs7103411	11-27656701	179656	c	t	0.21	0.04 (0.006)	2.6E-11	n/a	n/a	-0.012	0.026	6.5E-01
87	72	rs16918636	11-29080758	182237	t	c	0.79	0.03 (0.006)	3.2E-08	n/a	n/a	0.021	0.027	4.2E-01
88	73	rs4756059	11-46107195	179478	t	c	0.92	0.07 (0.01)	4.5E-13	n/a	n/a	-0.041	0.041	3.1E-01
89	74	rs2063730	11-77726172	179293	c	a	0.18	0.05 (0.007)	2.3E-12	n/a	n/a	0.020	0.028	4.8E-01
90	75	rs10895140	11-100941931	179647	g	a	0.66	0.04 (0.005)	6.7E-14	n/a	n/a	0.039	0.023	9.6E-02
91	76	rs11215400	11-114557845	179376	c	a	0.27	0.04 (0.006)	6.8E-11	n/a	n/a	-0.016	0.026	5.4E-01
92	77	rs1461503	11-122350285	179603	c	a	0.57	0.05 (0.005)	2.7E-26	n/a	n/a	0.037	0.023	1.0E-01
93	78	rs7955374	12-46166416	179419	t	c	0.13	0.04 (0.008)	9.5E-09	n/a	n/a	0.012	0.034	7.3E-01
94	79	rs7138803	12-48533735	174834	g	a	0.62	0.04 (0.005)	1.7E-12	n/a	n/a	0.020	0.023	4.0E-01
95	80	rs6563739	13-39137785	179667	g	t	0.34	0.03 (0.005)	2.3E-11	n/a	n/a	0.002	0.024	9.2E-01
96	81	rs1324913	13-73533589	182393	g	t	0.65	0.03 (0.005)	3.1E-10	n/a	n/a	0.004	0.023	8.7E-01
97	82	rs9560113	13-110981349	179359	g	a	0.28	0.05 (0.006)	2.1E-17	n/a	n/a	0.054	0.025	2.9E-02
98	83	rs1254337	14-59990278	179658	t	a	0.31	0.04 (0.005)	2.1E-16	n/a	n/a	0.046	0.024	5.1E-02
99	84	rs1958560	14-65106548	179655	a	g	0.59	0.03 (0.005)	3.7E-08	n/a	n/a	0.026	0.023	2.5E-01
100	85	rs10144321	14-99952158	179595	a	g	0.75	0.04 (0.006)	9.0E-15	0.04 (0.006)	1.1E-14	0.039	0.026	1.3E-01
101		rs7141210	14-100252223	172034	t	c	0.34	0.03 (0.005)	5.8E-09	0.03 (0.005)	4.1E-09	-0.019	0.024	4.4E-01
102	86	rs12148769	15-21703187	182411	g	a	0.9	0.05 (0.008)	5.2E-11	n/a	n/a	0.029	0.039	4.6E-01
103	87	rs3743266	15-58568805	182389	t	c	0.68	0.04 (0.005)	2.4E-13	n/a	n/a	0.022	0.023	3.5E-01
104	88	rs8032675	15-65746518	179630	t	c	0.4	0.04 (0.005)	2.1E-13	n/a	n/a	0.048	0.023	3.6E-02
105	89	rs12915845	15-86843471	179535	c	t	0.58	0.03 (0.005)	2.7E-12	n/a	n/a	-0.003	0.023	8.9E-01
106	90	rs246185	16-14302933	177773	c	t	0.33	0.04 (0.006)	6.8E-16	n/a	n/a	0.057	0.024	1.6E-02
107	91	rs12446632	16-19842890	182401	a	g	0.13	0.04 (0.007)	1.3E-08	n/a	n/a	0.031	0.033	3.5E-01
108	92	rs1129700	16-29825535	181797	t	c	0.44	0.03 (0.005)	2.3E-09	n/a	n/a	-0.019	0.023	4.1E-01
109	93	rs8050136	16-52373776	182365	c	a	0.6	0.04 (0.005)	1.7E-17	n/a	n/a	0.027	0.023	2.3E-01
110	94	rs1364063	16-68146073	182393	c	t	0.43	0.05 (0.005)	6.2E-21	0.04 (0.005)	4.8E-18	0.063	0.023	6.2E-03
111		rs929843	16-68603249	177329	a	c	0.23	0.04 (0.006)	1.2E-11	0.04 (0.006)	5.9E-09	0.033	0.027	2.2E-01
112	95	rs7215990	17-5975555	170053	g	a	0.76	0.04 (0.006)	1.9E-08	n/a	n/a	0.047	0.025	6.6E-02
113	96	rs9635759	17-46968784	179649	a	g	0.32	0.05 (0.005)	1.7E-24	n/a	n/a	0.054	0.024	2.6E-02
114	97	rs244293	17-50585721	179560	g	a	0.6	0.03 (0.005)	4.2E-11	n/a	n/a	0.012	0.023	5.8E-01
115	98	rs12607903	18-3807134	179171	c	t	0.3	0.04 (0.005)	5.4E-11	n/a	n/a	0.090	0.025	3.7E-04
116	99	rs2137289	18-43006123	178617	a	g	0.59	0.05 (0.005)	8.2E-20	n/a	n/a	0.034	0.023	1.4E-01
117	100	rs652260	19-7806562	182356	t	c	0.54	0.03 (0.005)	9.9E-09	n/a	n/a	0.022	0.022	3.3E-01
118	101	rs889122	19-9856867	179397	g	t	0.72	0.04 (0.006)	1.6E-13	n/a	n/a	0.030	0.025	2.4E-01
119	102	rs10423674	19-18678903	182377	a	c	0.34	0.04 (0.005)	9.2E-12	n/a	n/a	0.031	0.024	1.9E-01
120	103	rs852069	20-17070593	182413	g	a	0.64	0.04 (0.005)	1.2E-13	n/a	n/a	-0.004	0.023	8.6E-01
121	104	rs2836950	21-39526299	178602	c	g	0.64	0.03 (0.005)	6.2E-11	n/a	n/a	-0.001	0.023	9.5E-01
122	105	rs13053505	22-37575564	177596	g	t	0.8	0.04 (0.007)	3.0E-08	n/a	n/a	0.016	0.029	5.8E-01
123	106	rs6009583	22-48063650	181839	c	t	0.74	0.03 (0.006)	4.6E-08	n/a	n/a	0.058	0.025	2.3E-02

IAF: InterAct Allele Frequency (menarche raising allele). Univariate and joint model statistics are from the Discovery menarche GWAS meta-analysis.

Supplementary Table 4 | Follow up of menarche-associated SNPs for association with puberty timing in the EGG consortium.

						Association of menarche raising allele with Tanner Stage in both sexes *				Association of menarche raising allele with Tanner Stage in boys				Association of menarche raising allele with Tanner Stage in girls			
Locus	SNP	Location	Consensus Gene	Menarche Raising Allele	Menarche Other Allele	n	Beta	SE	P	n	Beta	SE	P	n	Beta	SE	P
1	rs2274465	1-43894144	KDM4A (N,C), PTPRF (E,C)	c	g	9915	-0.019	0.014	0.174	3769	-0.071	0.024	**0.004**	6146	0.006	0.017	0.731
2	rs10789181	1-65589155	LEPR (C)	a	g	9915	-0.034	0.014	**0.014**	3769	-0.028	0.024	0.253	6146	-0.038	0.017	**0.027**
3	rs3101336	1-72523773	NEGR1 (N,C)	t	c	9911	0.001	0.014	0.956	3769	0.026	0.024	0.278	6142	-0.011	0.016	0.500
4	rs7514705	1-74779308	TNNI3K (N), TYW3 (E)	c	t	9916	-0.018	0.013	0.189	3769	-0.045	0.023	0.053	6147	-0.004	0.016	0.800
5	rs11165924	1-98148036	DPYD (N)	a	g	9915	-0.010	0.014	0.485	3769	0.001	0.024	0.951	6146	-0.016	0.018	0.360
6	rs11578152	1-102349609	OLFM3 (N)	g	a	9915	-0.019	0.013	0.157	3769	-0.009	0.023	0.697	6146	-0.024	0.016	0.144
7	rs466639	1-163661506	RXRG (N,C)	c	t	9915	-0.011	0.020	0.587	3769	-0.052	0.035	0.145	6146	0.009	0.025	0.724
8	rs543874	1-176156103	SEC16B (N)	a	g	9915	-0.022	0.016	0.176	3769	-0.014	0.028	0.617	6146	-0.026	0.020	0.192
9	rs6427782	1-198064962	NR5A2 (N,C)	a	g	9914	-0.019	0.013	0.168	3769	-0.052	0.023	**0.025**	6145	-0.002	0.016	0.914
10	rs951366	1-203951975	NUCKS1 (N,E), RAB7L1 (E)	t	c	9915	-0.025	0.014	0.067	3769	-0.021	0.024	0.378	6146	-0.028	0.017	0.104
11	rs2947411	2-604168	TMEM18 (N,C)	a	g	9916	-0.036	0.017	**0.040**	3769	0.014	0.031	0.641	6147	-0.060	0.021	**0.005**
12	rs6747380	2-56441253	CCDC85A (N)	a	g	9912	-0.018	0.017	0.313	3769	-0.008	0.029	0.798	6143	-0.023	0.021	0.286
13	rs268067	2-59734549	BCL11A (N[~800kb])	a	g	9914	-0.014	0.017	0.412	3769	0.034	0.030	0.257	6145	-0.039	0.021	0.069
14	rs6758290	2-105231258	GPR45 (N)	t	c	9915	-0.006	0.013	0.654	3769	-0.006	0.023	0.808	6146	-0.006	0.016	0.705
15	rs12472911	2-141944979	LRP1B (N)	c	t	9907	-0.017	0.016	0.289	3769	-0.013	0.028	0.640	6138	-0.020	0.020	0.330
16	rs17236969	2-156460705	NR4A2 (N,C)	t	c	9914	-0.012	0.020	0.566	3769	-0.020	0.035	0.568	6145	-0.008	0.025	0.759
16	rs4369815	2-156835210	NR4A2 (N,C)	t	g	9912	-0.036	0.027	0.194	3768	-0.036	0.048	0.458	6144	-0.036	0.033	0.284
17a	rs1400974	2-199346935	SATB2 (N)	a	g	9914	-0.028	0.014	**0.041**	3769	0.005	0.023	0.837	6145	-0.046	0.017	**0.007**
17b	rs17233066	2-199352283	SATB2 (N)	c	t	9914	-0.068	0.036	0.062	3769	-0.005	0.064	0.942	6145	-0.097	0.044	**0.027**
17c	rs17266097	2-199983454	SATB2 (N)	t	c	9913	-0.023	0.014	0.097	3769	-0.014	0.024	0.553	6144	-0.027	0.017	0.107
18	rs6770162	3-24686017	THRB (N,C)	a	g	9914	-0.003	0.014	0.817	3769	-0.037	0.024	0.120	6145	0.014	0.017	0.416
19	rs7647973	3-49485935	WDR6 (E,C), UBA7 (C)	a	g	9916	0.005	0.015	0.744	3769	0.008	0.026	0.767	6147	0.004	0.018	0.846
19	rs6762477	3-50068213	WDR6 (E,C), UBA7 (C)	g	a	9916	0.026	0.013	0.057	3769	0.054	0.023	**0.022**	6147	0.012	0.016	0.464
20	rs7642134	3-86999572	POU1F1 (PIT1) (C)	g	a	9913	-0.020	0.013	0.147	3769	-0.018	0.023	0.429	6144	-0.020	0.016	0.221
21	rs9849248	3-88323964	ZNF654 (N,E,F), HTR1F (C)	c	t	9916	0.000	0.018	0.985	3769	0.003	0.032	0.920	6147	-0.002	0.022	0.927
22	rs11715566	3-119045126	IGSF11 (N[~1Mb])	t	c	9915	-0.001	0.013	0.963	3769	0.010	0.023	0.653	6146	-0.006	0.016	0.711
23	rs2687729	3-129377916	EEFSEC (N,E)	g	a	9916	0.009	0.015	0.566	3769	-0.037	0.026	0.152	6147	0.031	0.018	0.086
24	rs2600959	3-134098154	ACAD11 (E)	a	g	9914	0.007	0.014	0.638	3769	0.022	0.024	0.363	6145	-0.001	0.017	0.946
25	rs13067731	3-138472681	IL20RB (N)	t	c	9914	-0.014	0.018	0.449	3769	-0.007	0.031	0.819	6145	-0.017	0.022	0.441
26	rs900400	3-158281469	LEKR1 (N,E), CCNL1 (C)	t	c	9914	-0.022	0.014	0.113	3769	-0.034	0.024	0.151	6145	-0.016	0.017	0.348
27	rs939317	3-185528493	EIF4G1 (N)	g	a	9914	-0.015	0.015	0.322	3769	0.007	0.026	0.799	6145	-0.025	0.018	0.164
28	rs16860328	3-187118379	TRA2B (N), IGF2BP2 (C)	g	a	9916	0.000	0.013	0.980	3769	-0.001	0.023	0.980	6147	0.000	0.016	0.989
29	rs1038903	4-28361152	PCDH7 (N[~2Mb])	t	c	9914	0.013	0.015	0.368	3769	-0.002	0.026	0.946	6145	0.021	0.018	0.252
30	rs10938397	4-44877284	GNPDA2 (N)	a	g	9915	-0.017	0.013	0.203	3769	-0.005	0.023	0.824	6146	-0.023	0.016	0.160

Supplementary Table 4 (continued) | Follow up of menarche-associated SNPs for association with puberty timing in the EGG consortium.

						Association of menarche raising allele with Tanner Stage in both sexes				Association of menarche raising allele with Tanner Stage in boys				Association of menarche raising allele with Tanner Stage in girls			
Locus	SNP	Location	Consensus Gene	Menarche Raising Allele	Menarche Other Allele	n	Beta	SE	P	n	Beta	SE	P	n	Beta	SE	P
31	rs13135934	4-95426711	SMARCAD1 (N,E,F)	c	g	9916	-0.018	0.013	0.190	3769	0.002	0.023	0.925	6147	-0.027	0.016	0.095
32	rs3733631	4-104860552	TACR3 (N,C)	c	g	9916	-0.055	0.018	**0.003**	3769	-0.043	0.033	0.187	6147	-0.061	0.022	**0.006**
33	rs1532331	5-43152587	ZNF131 (N,E,C), GHR (C)	g	t	9914	-0.009	0.015	0.528	3769	0.002	0.025	0.950	6145	-0.015	0.018	0.414
34	rs17086188	5-95871610	PCSK1 (N,C)	a	g	2280	0.018	0.047	0.702	1396	0.020	0.064	0.749	884	0.015	0.069	0.825
35	rs251130	5-110887696	STARD4 (N,E,C)	g	a	9915	-0.024	0.015	0.113	3769	0.006	0.026	0.808	6146	-0.039	0.018	**0.033**
36	rs13179411	5-133928412	PHF15 (N), TCF7 (E)	t	g	9914	-0.021	0.019	0.267	3769	-0.015	0.031	0.622	6145	-0.024	0.023	0.307
37	rs17171818	5-137752902	KDM3B (N,C), BRD8 (C)	c	t	9912	-0.030	0.016	0.063	3769	-0.035	0.027	0.197	6143	-0.028	0.020	0.170
38	rs7701886	5-153527602	GALNT10 (N)	a	g	9916	0.009	0.013	0.509	3769	0.027	0.023	0.251	6147	0.000	0.016	0.994
39	rs9647570	5-167302841	TENM2 (N,C)	g	t	9916	-0.018	0.019	0.333	3769	0.007	0.032	0.831	6147	-0.031	0.023	0.177
40	rs6555855	5-168682315	SLIT3 (N)	g	a	9913	0.018	0.016	0.263	3769	0.022	0.028	0.427	6144	0.016	0.020	0.415
41	rs16896742	6-30030719	HLA-A (N)	g	a	9909	0.003	0.014	0.855	3767	-0.016	0.024	0.499	6142	0.012	0.017	0.483
42	rs2479724	6-41998960	BYSL (N,E), FRS3 (C)	t	c	9914	-0.009	0.013	0.518	3769	-0.025	0.023	0.273	6145	0.000	0.016	0.990
43	rs988913	6-54864267	FAM83B (N), HCRTR2 (C)	c	t	9915	-0.025	0.014	0.076	3769	-0.012	0.024	0.602	6146	-0.031	0.017	0.070
44	rs9475752	6-56888700	DST (N), BEND6 (E)	c	t	9915	-0.004	0.017	0.832	3769	0.016	0.029	0.580	6146	-0.013	0.020	0.513
45	rs9447700	6-77224806	IMPG1 (N)	c	t	9916	0.008	0.014	0.601	3769	-0.009	0.025	0.719	6147	0.015	0.017	0.376
46a	rs9321659	6-100222813	SIM1 (C), MCHR2 (C)	a	g	9912	-0.006	0.020	0.764	3769	-0.010	0.035	0.767	6143	-0.004	0.024	0.870
46b	rs4840086	6-100315159	SIM1 (C), MCHR2 (C)	a	g	9914	-0.012	0.013	0.394	3769	0.031	0.023	0.189	6145	-0.033	0.016	**0.048**
46c	rs13196561	6-100866891	SIM1 (N,C), MCHR2 (C)	c	a	9910	-0.030	0.016	0.062	3767	-0.018	0.028	0.522	6143	-0.037	0.020	0.065
46d	rs239198	6-101240798	SIM1 (C), ASCC3 (N,E,F)	t	c	9915	-0.004	0.013	0.775	3769	-0.026	0.023	0.261	6146	0.007	0.016	0.662
47a	rs4946632	6-105207901	LIN28B (C)	c	t	9915	0.005	0.022	0.804	3769	0.002	0.039	0.957	6146	0.007	0.027	0.791
47b	rs2153127	6-105455237	LIN28B (E,C)	t	c	9911	-0.061	0.013	**5.670E-06**	3768	-0.049	0.023	**0.032**	6143	-0.067	0.016	**4.770E-05**
47c	rs7759938	6-105485647	LIN28B (N,C)	c	t	9914	-0.080	0.014	**3.420E-08**	3769	-0.063	0.025	**0.012**	6145	-0.088	0.018	**5.570E-07**
48	rs4895808	6-126823127	CENPW (N,E), NCOA7 (C)	c	t	9915	-0.027	0.013	**0.044**	3769	0.001	0.023	0.969	6146	-0.041	0.016	**0.013**
49	rs6938574	6-128432673	PTPRK (N)	t	c	9915	-0.002	0.019	0.920	3769	0.034	0.033	0.302	6146	-0.018	0.022	0.419
50	rs6933660	6-151845447	ESR1 (C)	c	a	9907	0.000	0.014	0.974	3766	-0.005	0.024	0.827	6141	0.004	0.018	0.842
51	rs1079866	7-41436618	INHBA (N,C)	g	c	9915	-0.054	0.019	**0.005**	3769	-0.048	0.033	0.147	6146	-0.058	0.024	**0.015**
52	rs6964833	7-73739845	GTF2I (N,C)	t	c	9914	-0.045	0.015	**0.003**	3769	-0.021	0.027	0.431	6145	-0.057	0.019	**0.002**
53	rs11767400	7-121947978	CADPS2 (N)	a	c	9914	0.007	0.015	0.644	3769	0.016	0.025	0.535	6145	0.002	0.018	0.898
54a	rs2688325	8-3754618	CSMD1 (N)	t	c	9916	-0.017	0.015	0.253	3769	-0.040	0.025	0.115	6147	-0.005	0.018	0.774
54b	rs7828501	8-4547489	CSMD1 (N)	g	a	9915	-0.018	0.013	0.180	3769	-0.010	0.023	0.657	6146	-0.022	0.016	0.181
54c	rs7463166	8-4821198	CSMD1 (N)	a	g	9915	-0.002	0.014	0.881	3769	-0.026	0.024	0.273	6146	0.010	0.017	0.557
55	rs16918254	8-53931766	NPBWR1 (N,C)	a	g	9915	0.013	0.025	0.593	3769	0.027	0.044	0.541	6146	0.007	0.030	0.818
56	rs7821178	8-78256392	PEX2 (N)	c	a	9904	-0.009	0.014	0.524	3769	-0.049	0.024	**0.044**	6135	0.011	0.017	0.532
57	rs1469039	8-140720961	KCNK9 (N)	a	g	9915	-0.038	0.017	**0.028**	3769	-0.030	0.029	0.302	6146	-0.041	0.021	**0.048**
58	rs4875053	8-144944399	SCRIB (N), PARP10 (E)	g	c	9912	0.007	0.014	0.631	3769	0.030	0.025	0.219	6143	-0.005	0.018	0.769
59a	rs7037266	9-6932940	KDM4C (N)	a	c	9914	-0.023	0.014	0.100	3769	-0.038	0.024	0.120	6145	-0.016	0.017	0.351
59b	rs913588	9-7164673	KDM4C (N,F,C)	g	a	9916	-0.021	0.013	0.110	3769	-0.023	0.023	0.317	6147	-0.021	0.016	0.209
60	rs7865468	9-10264080	PTPRD (N)	a	g	9914	-0.003	0.014	0.831	3769	-0.014	0.025	0.592	6145	0.002	0.018	0.911

Supplementary Table 4 (continued) | Follow up of menarche-associated SNPs for association with puberty timing in the EGG consortium.

						Association of menarche raising allele with Tanner Stage in both sexes				Association of menarche raising allele with Tanner Stage in boys				Association of menarche raising allele with Tanner Stage in girls			
Locus	SNP	Location	Consensus Gene	Menarche Raising Allele	Menarche Other Allele	n	Beta	SE	P	n	Beta	SE	P	n	Beta	SE	P
61	rs7853970	9-85905386	RMI1 (N), NTRK2 (C)	t	c	9912	-0.018	0.014	0.186	3769	-0.005	0.024	0.835	6143	-0.025	0.017	0.139
62a	rs10816359	9-107797491	TMEM38B (N)	t	g	9914	-0.036	0.020	0.083	3769	-0.059	0.035	0.088	6145	-0.023	0.025	0.361
62b	rs10453225	9-107960041	TMEM38B (N)	g	t	9916	-0.060	0.014	**2.490E-05**	3769	-0.074	0.025	**0.003**	6147	-0.053	0.017	**0.002**
62c	rs10739221	9-108100651	TMEM38B (N)	c	t	9914	-0.048	0.016	**0.003**	3769	-0.056	0.029	**0.048**	6145	-0.044	0.019	**0.023**
63	rs11792861	9-110849116	TMEM245 (N,E)	a	c	9914	-0.007	0.015	0.651	3769	0.013	0.026	0.601	6145	-0.016	0.018	0.358
64	rs10980854	9-113090178	ZNF483 / OR2K2 (N)	a	g	9916	-0.020	0.029	0.489	3769	-0.025	0.050	0.619	6147	-0.018	0.035	0.617
64	rs10980921	9-113319733	ZNF483 / OR2K2 (N)	c	t	9915	0.003	0.024	0.893	3769	-0.001	0.043	0.989	6146	0.005	0.030	0.864
65	rs1874984	10-1721871	ADARB2 (N)	c	g	9913	-0.015	0.014	0.283	3769	-0.029	0.025	0.243	6144	-0.009	0.017	0.613
66	rs12571664	10-121698919	SEC23IP (N,E)	t	c	9914	-0.019	0.017	0.249	3769	-0.022	0.029	0.451	6145	-0.018	0.020	0.376
67	rs1915146	10-126836204	CTBP2 (N,C)	g	a	9913	-0.007	0.014	0.605	3769	0.009	0.024	0.701	6144	-0.015	0.017	0.366
68	rs7104764	11-219977	SIRT3 (N,E,C)	g	a	9916	-0.042	0.015	**0.006**	3769	-0.027	0.026	0.306	6147	-0.050	0.019	**0.008**
69	rs4929947	11-8596570	TRIM66 (N,E,F)	g	c	9915	-0.017	0.014	0.215	3769	-0.014	0.024	0.554	6146	-0.019	0.017	0.269
70	rs11022756	11-13272015	ARNTL (N), PTH (C)	a	c	9915	-0.044	0.015	**0.003**	3769	-0.045	0.025	0.078	6146	-0.043	0.018	**0.017**
71	rs7103411	11-27656701	BDNF (N,C), LGR4 (C)	c	t	9916	-0.021	0.016	0.202	3769	-0.038	0.028	0.169	6147	-0.012	0.020	0.556
72	rs16918636	11-29080758	FSHB (N[~1mb],C)	t	c	9897	-0.015	0.016	0.350	3759	-0.038	0.028	0.170	6138	-0.003	0.020	0.861
73	rs4756059	11-46107195	PHF21A (N)	t	c	9914	-0.021	0.025	0.409	3769	-0.022	0.044	0.623	6145	-0.020	0.030	0.504
74	rs2063730	11-77726172	GAB2 (N), THRSP (C)	c	a	9915	0.000	0.018	0.989	3769	-0.036	0.030	0.230	6146	0.018	0.022	0.398
75	rs10895140	11-100941931	TRPC6 (N), PGR (C)	g	a	9915	-0.004	0.014	0.774	3769	-0.003	0.024	0.886	6146	-0.004	0.017	0.801
76	rs11215400	11-114557845	CADM1 (N)	c	a	9914	-0.013	0.015	0.401	3769	0.017	0.026	0.527	6145	-0.027	0.019	0.141
77	rs1461503	11-122350285	BSX (N,C)	c	a	9915	-0.026	0.013	0.053	3769	-0.007	0.023	0.765	6146	-0.035	0.016	**0.030**
78	rs7955374	12-46166416	VDR (C)	t	c	9914	-0.024	0.021	0.252	3769	-0.010	0.036	0.775	6145	-0.031	0.026	0.228
79	rs7138803	12-48533735	BCDIN3D (N)	g	a	9913	-0.028	0.014	**0.041**	3766	-0.037	0.023	0.114	6147	-0.023	0.017	0.164
80	rs6563739	13-39137785	COG6 (N,E)	g	t	9916	-0.010	0.014	0.490	3769	-0.019	0.024	0.434	6147	-0.005	0.017	0.768
81	rs1324913	13-73533589	KLF12 (N)	g	t	9914	-0.009	0.014	0.517	3769	0.050	0.024	**0.041**	6145	-0.038	0.017	**0.027**
82	rs9560113	13-110981349	TEX29 (N)	g	a	9915	-0.034	0.015	**0.021**	3769	-0.026	0.025	0.314	6146	-0.039	0.018	**0.033**
83	rs1254337	14-59990278	SIX6 (N)	t	a	9915	-0.008	0.015	0.580	3769	0.013	0.025	0.618	6146	-0.019	0.018	0.302
84	rs1958560	14-65106548	FUT8 (N,E)	a	g	9914	-0.011	0.013	0.395	3769	-0.027	0.023	0.250	6145	-0.004	0.016	0.812
85a	rs10144321	14-99952158	DLK1 (C),	a	g	9914	-0.028	0.016	0.075	3769	-0.024	0.027	0.380	6145	-0.030	0.019	0.117
85b	rs7141210	14-100252223	DLK1 (N,E,C)	t	c	9914	0.004	0.014	0.769	3769	0.036	0.025	0.157	6145	-0.011	0.018	0.531
86	rs12148769	15-21703187	MKRN3 (C), MAGEL2 (C)	g	a	9914	-0.025	0.022	0.265	3768	-0.032	0.038	0.405	6146	-0.021	0.027	0.434
87	rs3743266	15-58568805	RORA (N,C)	t	c	9912	-0.048	0.014	**0.001**	3769	-0.033	0.025	0.175	6143	-0.055	0.017	**0.002**
88	rs8032675	15-65746518	MAP2K5 (N)	t	c	9915	0.006	0.013	0.660	3769	0.014	0.023	0.541	6146	0.002	0.016	0.912
89	rs12915845	15-86843471	DET1 (N,E)	c	t	9911	-0.039	0.013	**0.004**	3769	-0.073	0.023	**0.002**	6142	-0.022	0.016	0.176
90	rs246185	16-14302933	MKL2 (N)	c	t	9913	-0.057	0.015	**1.970E-04**	3769	-0.131	0.026	**5.010E-07**	6144	-0.019	0.019	0.309

Supplementary Table 4 (continued) | Follow up of menarche-associated SNPs for association with puberty timing in the EGG consortium.

				Menarche Raising Allele	Menarche Other Allele	Association of menarche raising allele with Tanner Stage in both sexes				Association of menarche raising allele with Tanner Stage in boys				Association of menarche raising allele with Tanner Stage in girls			
Locus	SNP	Location	Consensus Gene			n	Beta	SE	P	n	Beta	SE	P	n	Beta	SE	P
91	rs12446632	16-19842890	GPRC5B (N,C)	a	g	9914	-0.058	0.019	**0.003**	3768	-0.085	0.033	**0.011**	6146	-0.045	0.023	0.057
92	rs1129700	16-29825535	KCTD13 (N), TBX6 (E,C)	t	c	9907	-0.016	0.014	0.248	3768	-0.012	0.023	0.610	6139	-0.018	0.017	0.288
93	rs8050136	16-52373776	FTO (N,C)	c	a	9914	-0.028	0.013	**0.040**	3769	0.001	0.023	0.982	6145	-0.042	0.016	**0.011**
94a	rs1364063	16-68146073	COG4 (C), NFAT5 (N)	c	t	9913	-0.014	0.013	0.301	3769	-0.022	0.023	0.350	6144	-0.010	0.016	0.538
94b	rs929843	16-68603249	COG4 (C), WWP2 (N)	a	c	9914	0.003	0.017	0.881	3769	0.035	0.030	0.242	6145	-0.013	0.021	0.532
95	rs7215990	17-5975555	WSCD1 (N,E), ALOX15B (E)	g	a	9915	-0.008	0.016	0.604	3769	-0.025	0.028	0.372	6146	0.000	0.019	0.990
96	rs9635759	17-46968784	CA10 (N)	a	g	9912	-0.017	0.015	0.254	3769	0.039	0.026	0.129	6143	-0.046	0.018	**0.013**
97	rs244293	17-50585721	STXBP4 (N,E)	g	a	9915	-0.023	0.014	0.087	3769	-0.039	0.023	0.093	6146	-0.015	0.017	0.355
98	rs12607903	18-3807134	DLGAP1 (N)	c	t	9914	-0.008	0.015	0.608	3769	-0.029	0.026	0.264	6145	0.003	0.018	0.889
99	rs2137289	18-43006123	SKOR2 (N)	a	g	9914	-0.006	0.014	0.664	3769	0.007	0.024	0.752	6145	-0.012	0.017	0.453
100	rs652260	19-7806562	EVI5L (N), RETN (C)	t	c	9912	-0.014	0.013	0.290	3769	0.009	0.023	0.710	6143	-0.026	0.016	0.118
101	rs889122	19-9856867	OLFM2 (N), RDH8 (C)	g	t	9914	-0.032	0.015	**0.030**	3769	-0.042	0.026	0.109	6145	-0.028	0.018	0.123
102	rs10423674	19-18678903	CRTC1 (N,C)	a	c	9915	-0.031	0.014	**0.030**	3769	-0.002	0.024	0.951	6146	-0.045	0.017	**0.009**
103	rs852069	20-17070593	PCSK2 (N,C)	g	a	9916	-0.006	0.014	0.658	3769	0.011	0.024	0.632	6147	-0.015	0.017	0.375
104	rs2836950	21-39526299	BRWD1 (N,C)	c	g	9914	-0.023	0.014	0.093	3769	-0.020	0.024	0.396	6145	-0.025	0.017	0.142
105	rs13053505	22-37575564	NPTXR (N,E), CBX7 (C)	g	t	9913	-0.025	0.017	0.152	3769	-0.004	0.030	0.898	6144	-0.035	0.021	0.095
106	rs6009583	22-48063650	C22orf34 (N)	c	t	9916	-0.019	0.015	0.211	3769	-0.042	0.026	0.110	6147	-0.008	0.018	0.673

* Together, the 106 menarche loci explained 2.15% of the variance in Tanner stage in boys and girls in ALSPAC, the largest single study in the EGG Consortium (n=3009 girls and n=2373 boys at age 14 years).

Supplementary Table 5 | Parent-of-Origin specific associations with age at menarche for loci in imprinted / non-imprinted regions, in the DeCODE study.

Position	SNP	Ref allele	Paternal		Maternal		P_{het}	Imputation status	Imputed region
			Beta	P value	Beta	P value			
14-100252223	rs7141210	T	0.06 (0.03 - 0.08)	2.1E-04	-0.02 (-0.05 - 0.01)	1.2E-01	0.00021	Imprinted	99763005-100897120
19-18678903	rs10423674	C	-0.05 (-0.08 - -0.02)	1.5E-03	0.03 (0 - 0.06)	7.7E-02	0.00047	Not Imprinted	-
8-140720961	rs1469039	G	-0.01 (-0.04 - 0.03)	7.4E-01	-0.08 (-0.12 - -0.05)	5.7E-06	0.0029	Imprinted	140182263-141284481
15-21703187	rs12148769	G	0.11 (0.07 - 0.16)	2.5E-06	0.02 (-0.03 - 0.07)	4.3E-01	0.0058	Imprinted	20861546-21983542
7-41436618	rs1079866	C	-0.02 (-0.06 - 0.02)	3.2E-01	-0.1 (-0.14 - -0.06)	1.4E-06	0.0061	Not Imprinted	-
14-99952158	rs10144321	A	0.07 (0.04 - 0.11)	3.1E-05	0.01 (-0.02 - 0.05)	4.7E-01	0.015	Imprinted	99763005-100897120
13-110981349	rs9560113	A	-0.05 (-0.08 - -0.02)	1.1E-03	0 (-0.03 - 0.03)	8.8E-01	0.027	Not Imprinted	-
1-176156103	rs543874	A	0 (-0.03 - 0.04)	8.4E-01	0.06 (0.02 - 0.09)	2.4E-03	0.045	Not Imprinted	-
3-129377916	rs2687729	A	-0.03 (-0.06 - 0)	5.9E-02	0.01 (-0.02 - 0.05)	3.9E-01	0.052	Not Imprinted	-
3-134098154	rs2600959	A	0.04 (0.01 - 0.07)	4.7E-03	0 (-0.03 - 0.03)	7.7E-01	0.073	Not Imprinted	-
2-199983454	rs17266097	C	-0.02 (-0.05 - 0.01)	1.2E-01	-0.06 (-0.09 - -0.03)	4.5E-05	0.074	Not Imprinted	-
5-43152587	rs1532331	G	0 (-0.03 - 0.03)	9.4E-01	0.03 (0 - 0.06)	2.5E-02	0.099	Not Imprinted	-
13-73533589	rs1324913	G	0 (-0.03 - 0.03)	9.0E-01	0.03 (0 - 0.06)	3.0E-02	0.1	Not Imprinted	-
6-128432673	rs6938574	T	0.05 (0.01 - 0.08)	1.6E-02	0 (-0.03 - 0.04)	8.8E-01	0.11	Not Imprinted	-
11-8596570	rs4929947	G	0.05 (0.02 - 0.08)	2.9E-03	0.01 (-0.02 - 0.04)	4.3E-01	0.12	Not Imprinted	-
16-19842890	rs12446632	G	-0.02 (-0.07 - 0.02)	3.2E-01	-0.08 (-0.12 - -0.03)	1.4E-03	0.12	Not Imprinted	-
14-65106548	rs1958560	G	0 (-0.03 - 0.03)	9.5E-01	-0.03 (-0.06 - 0)	3.0E-02	0.13	Not Imprinted	-
12-48533735	rs7138803	G	0.01 (-0.02 - 0.04)	3.4E-01	0.05 (0.02 - 0.08)	2.3E-03	0.14	Not Imprinted	-
2-156460705	rs17236969	C	-0.01 (-0.06 - 0.03)	5.7E-01	-0.06 (-0.1 - -0.01)	9.0E-03	0.15	Not Imprinted	-
21-39526299	rs2836950	C	0.04 (0.01 - 0.07)	2.2E-02	0 (-0.03 - 0.03)	8.0E-01	0.15	Not Imprinted	-
6-41998960	rs2479724	T	0.04 (0.02 - 0.07)	2.4E-03	0.01 (-0.01 - 0.04)	3.1E-01	0.16	Not Imprinted	-
1-163661506	rs466639	T	-0.07 (-0.11 - -0.03)	1.2E-03	-0.03 (-0.07 - 0.01)	1.8E-01	0.18	Not Imprinted	-
18-43006123	rs2137289	G	-0.06 (-0.09 - -0.03)	2.7E-05	-0.03 (-0.06 - -0.01)	1.9E-02	0.19	Imprinted	42308570-43310446
4-95426711	rs13135934	G	-0.04 (-0.07 - -0.01)	1.1E-02	-0.01 (-0.04 - 0.02)	4.8E-01	0.19	Not Imprinted	-
2-59734549	rs268067	G	-0.04 (-0.08 - -0.01)	1.8E-02	-0.01 (-0.04 - 0.02)	5.4E-01	0.21	Not Imprinted	-
10-121698919	rs12571664	T	0 (-0.04 - 0.03)	8.5E-01	0.03 (-0.01 - 0.06)	1.2E-01	0.22	Not Imprinted	-
9-85905386	rs7853970	T	0.03 (0 - 0.06)	6.7E-02	0.05 (0.02 - 0.08)	4.0E-04	0.23	Not Imprinted	-
1-98148036	rs11165924	A	0.02 (-0.01 - 0.05)	1.2E-01	0 (-0.03 - 0.03)	9.2E-01	0.24	Not Imprinted	-
18-3807134	rs12607903	C	0.06 (0.03 - 0.09)	2.9E-04	0.03 (0 - 0.06)	5.1E-02	0.24	Not Imprinted	-
3-119045126	rs11715566	C	-0.02 (-0.05 - 0.01)	1.3E-01	-0.05 (-0.08 - -0.02)	1.4E-03	0.24	Not Imprinted	-
2-141944979	rs12472911	C	0.03 (0 - 0.07)	5.5E-02	0.06 (0.03 - 0.09)	4.6E-04	0.26	Not Imprinted	-
11-46107195	rs4756059	C	-0.09 (-0.15 - -0.03)	2.4E-03	-0.05 (-0.11 - 0.02)	1.5E-01	0.27	Not Imprinted	-
16-68603249	rs929843	A	0.02 (-0.01 - 0.05)	2.6E-01	0.04 (0.01 - 0.08)	8.3E-03	0.29	Not Imprinted	-
9-7164673	rs913588	G	0.02 (-0.01 - 0.05)	1.8E-01	0.04 (0.01 - 0.07)	4.5E-03	0.29	Not Imprinted	-
3-158281469	rs900400	T	0 (-0.03 - 0.03)	9.0E-01	0.02 (-0.01 - 0.05)	1.1E-01	0.3	Not Imprinted	-
11-27656701	rs7103411	C	0.04 (0 - 0.08)	2.8E-02	0.07 (0.03 - 0.11)	3.2E-04	0.32	Not Imprinted	-
10-126836204	rs1915146	A	-0.02 (-0.05 - 0.01)	1.2E-01	0 (-0.03 - 0.03)	8.7E-01	0.33	Not Imprinted	-
3-49485935	rs7647973	G	-0.04 (-0.07 - -0.01)	2.0E-02	-0.02 (-0.05 - 0.02)	3.1E-01	0.35	Not Imprinted	-
5-167302841	rs9647570	T	-0.01 (-0.05 - 0.03)	6.2E-01	-0.04 (-0.08 - 0)	6.8E-02	0.35	Not Imprinted	-
4-104860552	rs3733631	G	-0.07 (-0.11 - -0.03)	2.5E-04	-0.05 (-0.09 - -0.01)	2.1E-02	0.36	Not Imprinted	-

4-44877284	rs10938397	A	0.04 (0.01 - 0.07)	3.6E-03	0.02 (0 - 0.05)	1.0E-01	0.37	Not Imprinted	-
2-604168	rs2947411	A	0.05 (0.01 - 0.08)	2.0E-02	0.07 (0.03 - 0.11)	3.2E-04	0.38	Not Imprinted	-
9-113319733	rs10980921	T	-0.09 (-0.14 - -0.04)	7.0E-04	-0.06 (-0.11 - 0)	3.2E-02	0.38	Not Imprinted	-
15-65746518	rs8032675	T	0.04 (0.01 - 0.07)	6.5E-03	0.06 (0.03 - 0.09)	8.9E-05	0.39	Not Imprinted	-
16-68146073	rs1364063	T	-0.03 (-0.06 - 0)	4.8E-02	-0.05 (-0.08 - -0.02)	1.4E-03	0.39	Not Imprinted	-
6-54864267	rs988913	C	0.03 (0 - 0.06)	5.5E-02	0.01 (-0.02 - 0.04)	4.5E-01	0.41	Not Imprinted	-
19-9856867	rs889122	G	0.05 (0.02 - 0.08)	2.4E-03	0.03 (0 - 0.06)	5.4E-02	0.43	Not Imprinted	-
6-30030719	rs16896742	A	-0.04 (-0.07 - -0.01)	9.8E-03	-0.02 (-0.05 - 0.01)	1.4E-01	0.44	Not Imprinted	-
9-107797491	rs10816359	T	0.04 (0 - 0.08)	5.0E-02	0.02 (-0.02 - 0.06)	3.6E-01	0.46	Not Imprinted	-
11-114557845	rs11215400	A	-0.02 (-0.05 - 0.01)	2.1E-01	-0.04 (-0.07 - -0.01)	2.3E-02	0.47	Not Imprinted	-
4-28361152	rs1038903	C	0 (-0.04 - 0.03)	8.0E-01	0.01 (-0.02 - 0.04)	4.3E-01	0.47	Not Imprinted	-
1-203951975	rs951366	T	0.02 (-0.01 - 0.05)	2.2E-01	0.03 (0 - 0.06)	2.9E-02	0.5	Not Imprinted	-
11-13272015	rs11022756	A	0.05 (0.01 - 0.08)	5.2E-03	0.03 (0 - 0.06)	6.7E-02	0.5	Not Imprinted	-
6-105455237	rs2153127	T	0.06 (0.04 - 0.09)	9.3E-06	0.05 (0.02 - 0.08)	5.1E-04	0.5	Not Imprinted	-
1-72523773	rs3101336	T	0.02 (-0.01 - 0.04)	2.9E-01	0.03 (0 - 0.06)	4.5E-02	0.51	Not Imprinted	-
3-138472681	rs13067731	C	-0.03 (-0.06 - 0.01)	1.6E-01	-0.01 (-0.05 - 0.03)	6.3E-01	0.51	Not Imprinted	-
6-126823127	rs4895808	C	0.03 (0 - 0.05)	8.2E-02	0.04 (0.01 - 0.07)	8.9E-03	0.53	Not Imprinted	-
17-46968784	rs9635759	G	-0.06 (-0.09 - -0.03)	8.5E-05	-0.05 (-0.08 - -0.02)	2.3E-03	0.54	Not Imprinted	-
1-198064962	rs6427782	G	0 (-0.03 - 0.03)	8.7E-01	-0.01 (-0.04 - 0.01)	3.2E-01	0.56	Not Imprinted	-
5-133928412	rs13179411	G	-0.05 (-0.08 - -0.01)	1.5E-02	-0.06 (-0.1 - -0.02)	1.3E-03	0.56	Not Imprinted	-
9-107960041	rs10453225	G	0.08 (0.05 - 0.12)	2.4E-07	0.07 (0.04 - 0.1)	1.5E-05	0.56	Not Imprinted	-
3-24686017	rs6770162	G	-0.03 (-0.06 - 0)	4.4E-02	-0.02 (-0.05 - 0.01)	2.3E-01	0.57	Not Imprinted	-
2-199346935	rs1400974	G	-0.02 (-0.05 - 0.01)	1.9E-01	-0.03 (-0.06 - 0)	3.7E-02	0.59	Not Imprinted	-
8-4821198	rs7463166	A	0.04 (0.01 - 0.07)	1.1E-02	0.05 (0.02 - 0.08)	1.0E-03	0.59	Not Imprinted	-
9-110849116	rs11792861	A	0.03 (-0.01 - 0.06)	1.1E-01	0.01 (-0.02 - 0.05)	4.2E-01	0.59	Not Imprinted	-
15-86843471	rs12915845	C	0.02 (-0.01 - 0.05)	1.1E-01	0.03 (0.01 - 0.06)	2.0E-02	0.6	Not Imprinted	-
6-105207901	rs4946632	T	0.01 (-0.05 - 0.06)	8.4E-01	0.02 (-0.03 - 0.07)	3.6E-01	0.62	Not Imprinted	-
3-187118379	rs16860328	A	-0.04 (-0.07 - -0.01)	6.1E-03	-0.03 (-0.06 - 0)	4.1E-02	0.63	Not Imprinted	-
6-100222813	rs9321659	G	-0.03 (-0.07 - 0.02)	2.5E-01	-0.04 (-0.08 - 0)	6.9E-02	0.63	Not Imprinted	-
3-185528493	rs939317	A	-0.06 (-0.09 - -0.03)	1.5E-04	-0.05 (-0.08 - -0.02)	1.8E-03	0.64	Not Imprinted	-
9-10264080	rs7865468	G	-0.03 (-0.06 - 0)	8.0E-02	-0.02 (-0.05 - 0.01)	2.7E-01	0.64	Not Imprinted	-
17-50585721	rs244293	A	-0.01 (-0.04 - 0.02)	3.9E-01	-0.02 (-0.05 - 0.01)	1.3E-01	0.65	Not Imprinted	-
5-137752902	rs17171818	C	0.04 (0.01 - 0.08)	1.6E-02	0.03 (0 - 0.07)	7.6E-02	0.65	Not Imprinted	-
13-39137785	rs6563739	G	0.04 (0.01 - 0.07)	1.4E-02	0.03 (0 - 0.06)	7.0E-02	0.66	Not Imprinted	-
5-95871610	rs17086188	A	-0.01 (-0.09 - 0.07)	8.2E-01	0.02 (-0.06 - 0.09)	7.0E-01	0.67	Not Imprinted	-
7-121947978	rs11767400	C	-0.02 (-0.06 - 0.01)	1.3E-01	-0.02 (-0.05 - 0.02)	3.4E-01	0.7	Not Imprinted	-
20-17070593	rs852069	A	-0.03 (-0.06 - 0)	5.3E-02	-0.02 (-0.05 - 0.01)	1.6E-01	0.71	Not Imprinted	-
22-48063650	rs6009583	C	0.03 (0 - 0.06)	6.9E-02	0.02 (-0.01 - 0.06)	1.9E-01	0.71	Not Imprinted	-
6-100315159	rs4840086	A	0.05 (0.02 - 0.08)	5.4E-04	0.04 (0.01 - 0.07)	3.5E-03	0.71	Not Imprinted	-
8-3754618	rs2688325	T	0.05 (0.02 - 0.08)	2.1E-03	0.04 (0.01 - 0.07)	1.1E-02	0.71	Not Imprinted	-
14-59990278	rs1254337	A	-0.02 (-0.05 - 0.01)	1.6E-01	-0.03 (-0.06 - 0)	5.5E-02	0.72	Not Imprinted	-
6-101240798	rs239198	C	-0.03 (-0.06 - 0)	6.6E-02	-0.02 (-0.05 - 0.01)	1.9E-01	0.72	Not Imprinted	-
1-65589155	rs10789181	A	0.02 (-0.01 - 0.05)	2.3E-01	0.02 (0 - 0.05)	9.8E-02	0.74	Not Imprinted	-
10-1721871	rs1874984	G	-0.03 (-0.06 - 0)	4.2E-02	-0.02 (-0.05 - 0.01)	1.2E-01	0.74	Not Imprinted	-

12-46166416	rs7955374	C	-0.04 (-0.09 - 0)	3.1E-02	-0.04 (-0.08 - 0.01)	8.7E-02	0.75	Not Imprinted	-
6-151845447	rs6933660	C	0.03 (-0.01 - 0.06)	1.0E-01	0.03 (0 - 0.07)	3.6E-02	0.75	Not Imprinted	-
7-73739845	rs6964833	T	0.02 (-0.02 - 0.05)	3.3E-01	0.01 (-0.02 - 0.04)	6.1E-01	0.75	Not Imprinted	-
6-105485647	rs7759938	C	0.09 (0.06 - 0.12)	5.3E-09	0.1 (0.07 - 0.13)	3.7E-10	0.76	Not Imprinted	-
6-100866891	rs13196561	C	0.02 (-0.02 - 0.05)	3.5E-01	0.02 (-0.01 - 0.06)	1.8E-01	0.77	Not Imprinted	-
9-6932940	rs7037266	C	-0.02 (-0.05 - 0.01)	2.9E-01	-0.02 (-0.05 - 0.01)	1.4E-01	0.77	Not Imprinted	-
1-74779308	rs7514705	T	-0.03 (-0.06 - -0.01)	1.8E-02	-0.03 (-0.06 - 0)	5.0E-02	0.78	Not Imprinted	-
3-86999572	rs7642134	A	-0.03 (-0.06 - 0)	3.0E-02	-0.04 (-0.07 - -0.01)	1.0E-02	0.78	Not Imprinted	-
3-88323964	rs9849248	C	0.02 (-0.02 - 0.06)	3.6E-01	0.02 (-0.01 - 0.06)	2.0E-01	0.8	Not Imprinted	-
5-168682315	rs6555855	G	0.02 (-0.01 - 0.05)	2.7E-01	0.01 (-0.02 - 0.05)	4.5E-01	0.8	Not Imprinted	-
5-110887696	rs251130	G	0.04 (0.01 - 0.07)	8.3E-03	0.05 (0.02 - 0.08)	3.1E-03	0.82	Not Imprinted	-
11-219977	rs7104764	G	0.04 (0 - 0.07)	4.0E-02	0.04 (0.01 - 0.08)	1.9E-02	0.84	Not Imprinted	-
19-7806562	rs652260	C	-0.02 (-0.05 - 0.01)	1.8E-01	-0.02 (-0.04 - 0.01)	3.0E-01	0.84	Not Imprinted	-
8-53931766	rs16918254	A	0.05 (0 - 0.1)	6.1E-02	0.06 (0 - 0.11)	3.3E-02	0.84	Not Imprinted	-
8-144944399	rs4875053	C	-0.01 (-0.04 - 0.02)	5.1E-01	-0.01 (-0.03 - 0.02)	7.1E-01	0.84	Not Imprinted	-
22-37575564	rs13053505	G	0.04 (0 - 0.08)	4.2E-02	0.03 (0 - 0.07)	7.9E-02	0.85	Not Imprinted	-
2-199352283	rs17233066	C	0.03 (-0.03 - 0.09)	3.1E-01	0.02 (-0.04 - 0.08)	4.4E-01	0.86	Not Imprinted	-
15-58568805	rs3743266	T	0.02 (-0.02 - 0.05)	3.3E-01	0.02 (-0.01 - 0.05)	2.3E-01	0.87	Not Imprinted	-
16-29825535	rs1129700	T	0.01 (-0.02 - 0.04)	5.1E-01	0.01 (-0.02 - 0.03)	6.8E-01	0.87	Not Imprinted	-
17-5975555	rs7215990	G	0.04 (0.01 - 0.07)	1.5E-02	0.04 (0 - 0.07)	2.8E-02	0.87	Not Imprinted	-
8-4547489	rs7828501	A	-0.03 (-0.06 - 0)	4.2E-02	-0.03 (-0.06 - 0)	7.2E-02	0.87	Not Imprinted	-
11-100941931	rs10895140	A	-0.04 (-0.07 - -0.01)	2.0E-02	-0.03 (-0.06 - 0)	3.4E-02	0.89	Not Imprinted	-
16-52373776	rs8050136	C	0.05 (0.02 - 0.08)	3.5E-04	0.05 (0.02 - 0.08)	7.7E-04	0.89	Not Imprinted	-
2-105231258	rs6758290	T	0.03 (0 - 0.06)	2.4E-02	0.04 (0.01 - 0.06)	1.4E-02	0.89	Not Imprinted	-
3-50068213	rs6762477	G	0.01 (-0.02 - 0.04)	4.4E-01	0.01 (-0.01 - 0.04)	3.4E-01	0.9	Not Imprinted	-
1-102349609	rs11578152	A	-0.02 (-0.05 - 0.01)	1.5E-01	-0.02 (-0.05 - 0.01)	1.1E-01	0.91	Not Imprinted	-
6-56888700	rs9475752	C	0.02 (-0.02 - 0.05)	3.5E-01	0.02 (-0.02 - 0.06)	2.7E-01	0.91	Imprinted	56790380-57799120
5-153527602	rs7701886	G	-0.01 (-0.04 - 0.02)	6.5E-01	-0.01 (-0.04 - 0.02)	5.4E-01	0.92	Not Imprinted	-
11-29080758	rs16918636	T	0.03 (-0.01 - 0.06)	1.4E-01	0.03 (-0.01 - 0.07)	1.1E-01	0.93	Not Imprinted	-
11-122350285	rs1461503	A	-0.03 (-0.06 - 0)	5.9E-02	-0.03 (-0.05 - 0)	8.0E-02	0.93	Not Imprinted	-
2-56441253	rs6747380	G	-0.08 (-0.12 - -0.04)	7.9E-05	-0.08 (-0.12 - -0.04)	4.8E-05	0.93	Not Imprinted	-
9-108100651	rs10739221	T	-0.07 (-0.1 - -0.03)	2.9E-04	-0.06 (-0.1 - -0.03)	4.9E-04	0.94	Not Imprinted	-
11-77726172	rs2063730	A	-0.04 (-0.08 - 0)	5.5E-02	-0.04 (-0.08 - 0)	4.5E-02	0.95	Not Imprinted	-
2-156835210	rs4369815	T	0.04 (-0.01 - 0.09)	1.2E-01	0.04 (-0.01 - 0.09)	1.2E-01	0.97	Not Imprinted	-
9-113090178	rs10980854	G	-0.04 (-0.1 - 0.02)	1.7E-01	-0.04 (-0.1 - 0.02)	1.8E-01	0.97	Not Imprinted	-
16-14302933	rs246185	T	-0.04 (-0.07 - -0.01)	5.9E-03	-0.04 (-0.07 - -0.01)	5.4E-03	0.98	Not Imprinted	-
1-43894144	rs2274465	C	0.03 (0 - 0.06)	4.1E-02	0.03 (0 - 0.06)	4.4E-02	0.99	Not Imprinted	-
6-77224806	rs9447700	C	0.01 (-0.02 - 0.04)	3.6E-01	0.01 (-0.02 - 0.04)	3.5E-01	0.99	Not Imprinted	-
8-78256392	rs7821178	C	0.02 (-0.01 - 0.05)	2.3E-01	0.02 (-0.01 - 0.05)	2.3E-01	1	Not Imprinted	-

Supplementary Table 6 | eQTL results across multiple tissues.

See data file

Supplementary Table 7 | eQTL results in whole blood.

See data file

Supplementary Table 8 | Candidate genes at or near menarche loci.

Locus	SNP	Location	Consensus Gene	Gene name: function	Role in Hormone Function
1	rs2274465	1-43894144	KDM4A (N,C), PTPRF (E,C)	i) Lysine (K)-specific demethylase 4A: Stimulates ERalpha activity. Inhibits Ras-mediated CHD5 induction, reducing p53 pathway activity. ii) Protein tyrosine phosphatase, receptor type, F: May contribute to pathogenesis of insulin resistance.	Y
2	rs10789181	1-65589155	LEPR (C)	Leptin receptor: Mediates adipocyte signalling on regulation of appetite and reproductive function.	Y
3	rs3101336	1-72523773	NEGR1 (N,C)	Neuronal growth regulator 1: May be a trans-neural growth-promoting factor in regenerative axons. BMI locus	
4	rs7514705	1-74779308	TNNI3K (N), TYW3 (E)	i) TNNI3 interacting kinase: MAP kinase kinase kinase. BMI locus. ii) Probable S-adenosyl-L-methionine-dependent methyltransferase that acts as a component of the wybutosine biosynthesis pathway	
5	rs11165924	1-98148036	DPYD (N)	Dihydropyrimidine dehydrogenase: Involved in uracil and thymidine catabolism.	
6	rs11578152	1-102349609	OLFM3 (N)	Olfactomedin 3: Possible role in brain and eye development, including cell migration and axon growth.	
7	rs466639	1-163661506	RXRG (N,C)	Retinoid X receptor, gamma: Nuclear hormone receptor; mediates the anti-proliferative effects of retinoic acid, and forms dimers with the retinoic acid, thyroid hormone and vitamin D receptors.	Y
8	rs543874	1-176156103	SEC16B (N)	SEC16 homolog B (S. cerevisiae): Organization of transitional endoplasmic reticulum sites and protein export. BMI locus	
9	rs6427782	1-198064962	NR5A2 (N,C)	Nuclear receptor subfamily 5, group A, member 2: Expressed in ovarian granulosa cells, role in steroidogenesis and ovulation. Interacts with the regulator of reproductive function NR5A1 (Steroidogenic factor 1)	Y
10	rs951366	1-203951975	NUCKS1 (N,E), RAB7L1 (E)	i) Nuclear casein kinase and cyclin-dependent kinase substrate 1: Encodes a nuclear protein which is phosphorylated by Cdk1 during mitosis. ii) RAB7, member RAS oncogene family-like 1: Unknown function	
11	rs2947411	2-604168	TMEM18 (N,C)	Transmembrane protein 18: Transcription repressor. Enhances the migration of neural stem and precursor cells. BMI locus	
12	rs6747380	2-56441253	CCDC85A (N)	Coiled-coil domain containing 85A: Unknown function	
13	rs268067	2-59734549	BCL11A (N[~800kb])	B-Cell CLL/Lymphoma 11A (Zinc Finger Protein): Functions as a myeloid and B-cell proto-oncogene	
14	rs6758290	2-105231258	GPR45 (N)	G protein-coupled receptor 45: Possible role in central nervous system signalling	
15	rs12472911	2-141944979	LRP1B (N)	Low density lipoprotein receptor-related protein 1B: Member of the low density lipoprotein (LDL) receptor gene family	
16	rs17236969	2-156460705	NR4A2 (N,C)	Nuclear receptor subfamily 4, group A, member 2: Transcription factor essential for differentiation of dopaminergic neurons in substantia nigra. Mutations in Parkinson's disease	
16	rs4369815	2-156835210	NR4A2 (N,C)	(as above)	
17a	rs1400974	2-199346935	SATB2 (N)	SATB homeobox 2: DNA binding protein that specifically binds nuclear matrix attachment regions. Mutations in cleft palate and mental retardation.	
17b	rs17233066	2-199352283	SATB2 (N)	(as above)	
17c	rs17266097	2-199983454	SATB2 (N)	(as above)	
18	rs6770162	3-24686017	THRB (N,C)	Thyroid hormone receptor, beta: Nuclear hormone receptor for triiodothyronine. Mutations in thyroid hormone resistance	Y
19	rs7647973	3-49485935	WDR6 (E,C), UBA7 (C)	i) WD Repeat Domain 6: Enhances serine/threonine kinase 11-induced cell growth supporession; negative regulator of amino acid starvation-induced autophagy. ii) Ubiquitin-Like Modifier Activating Enzyme 7: A RAR retinoic acid target that activates ubiquitin	
19	rs6762477	3-50068213	WDR6 (E,C), UBA7 (C)	(as above)	
20	rs7642134	3-86999572	POU1F1 (PIT1) (C)	POU class 1 homeobox 1: Regulates pituitary development. Mutations in combined pituitary hormone deficiency	Y
21	rs9849248	3-88323964	ZNF654 (N,E,F), HTR1F (C)	i) Zinc finger protein 654: May be involved in transcriptional regulation. ii) 5-Hydroxytryptamine (Serotonin) Receptor 1F, G Protein-Coupled: Unknown physiological role	
22	rs11715566	3-119045126	IGSF11 (N[~1Mb])	Immunoglobulin Superfamily Member 11: Cell adhesion molecule. Stimulates cell growth	
23	rs2687729	3-129377916	EEFSEC (N,E)	Eukaryotic elongation factor, selenocysteine-tRNA-specific: Translation factor necessary for the incorporation of selenocysteine into proteins	
24	rs2600959	3-134098154	ACAD11 (E)	Acyl-CoA dehydrogenase family, member 11: Exhibits maximal activity towards saturated C22-Co-enzyme A	
25	rs13067731	3-138472681	IL20RB (N)	Interleukin 20 Receptor Beta: Forms receptor for interleukin-19, 20 and 24.	
26	rs900400	3-158281469	LEKR1 (N,E), CCNL1 (C)	i) Leucine, glutamate and lysine rich 1: Unknown function. ii) Cyclin L1: Transcriptional regulator, role in pre-mRNA splicing. Birth weight locus.	
27	rs939317	3-185528493	EIF4G1 (N)	Eukaryotic translation initiation factor 4 gamma, 1: Regulates protein synthesis. Mutations in Parkinson's disease	
28	rs16860328	3-187118379	TRA2B (N), IGF2BP2 (C)	i) Transformer 2 beta homolog (Drosophila): Regulates mRNA processing, splicing and gene expression. ii) Insulin-like growth factor 2 mRNA binding protein 2: May regulate translation of target mRNAs.	
29	rs1038903	4-28361152	PCDH7 (N[~2Mb])	Protocadherin 7: An integral membrane protein thought to function in cell-cell recognition and adhesion	
30	rs10938397	4-44877284	GNPDA2 (N)	Glucosamine-6-phosphate deaminase 2: Catalyzes the conversion of D-glucosamine-6-phosphate to D-fructose-6-phosphate. BMI locus	
31	rs13135934	4-95426711	SMARCAD1 (N,E,F)	SWI/SNF-Related, Matrix-Associated Actin-Dependent Regulator Of Chromatin,Subfamily A, Containing DEAD/H Box 1: Encodes a helicase protein, with role in chromatin remodelling. Mutations in adermatoglyphia	
32	rs3733631	4-104860552	TACR3 (N,C)	Tachykinin receptor 3: Receptor for neurokinin 3. Mutations in hypogonadotropic hypogonadism	Y
33	rs1532331	5-43152587	ZNF131 (N,E,C), GHR (C)	i) Zinc finger protein 131: Inhibits estrogen receptor-alpha signaling. ii) Growth hormone receptor. Mutations in Laron syndrome and GH insensitivity.	Y
34	rs17086188	5-95871610	PCSK1 (N,C)	Proprotein convertase type 1: Prohormone convertase. Mutations in severe obesity with hormone deficiencies.	Y
35	rs251130	5-110887696	STARD4 (N,E,C)	StAR-related lipid transfer domain containing 4: Regulates intra-cellular cholesterol trafficking	Y

Supplementary Table 8 (continued) | Candidate genes at or near menarche loci.

Locus	SNP	Location	Consensus Gene	Gene name: function	Role in Hormone Function
36	rs13179411	5-133928412	PHF15 (N), TCF7 (E)	PHD zinc finger protein transcription factor: Component of the HBO1 complex which has a histone H4-specific acetyltransferase activity. ii) Transcription factor 7 (T-cell specific, HMG-box): Feedback repressor of TCF7L2. Regulates self-renewal of hematopoietic stem cells.	
37	rs17171818	5-137752902	KDM3B (N,C), BRD8 (C)	Lysine (K)-specific demethylase 3B: Histone H3K9 demethylase. ii) Bromodomain containing 8: Coactivator of hormone-activated nuclear receptors, including the thyroid hormone receptor.	Y
38	rs7701886	5-153527602	GALNT10 (N)	UDP-N-acetyl-alpha-D-galactosamine:polypeptide N-acetylgalactosaminyltransferase 10: Involved in synthesis of oligosaccarides. BMI locus in African Americans.	
39	rs9647570	5-167302841	TENM2 (N,C)	Teneurin transmembrane protein 2: Expressed in developing brain, and is induced by the Kallmann syndrome gene FGF8 product.	Y
40	rs6555855	5-168682315	SLIT3 (N)	Slit homolog 3: Involved in cell migration. Height locus (but not in LD with the height SNP [rs4282339])	
41	rs16896742	6-30030719	HLA-A (N)	Major histocompatibility complex, class I, A: Central role in immune regulation	
42	rs2479724	6-41998960	BYSL (N,E), FRS3 (C)	i) Bystin-Like: Possible role in trophinin-dependent regulation of cell adhesion during embryo implantation. ii) Fibroblast growth factor receptor substrate 3: Involved in signalling of the Kallmann syndrome gene FGFR1 product.	Y
43	rs988913	6-54864267	FAM83B (N), HCRTR2 (C)	i) Family with sequence similarity 83, member A: Unknown function. ii) Hypocretin (orexin) receptor 2: G-protein coupled receptor involved in the regulation of feeding behavior	
44	rs9475752	6-56888700	DST (N), BEND6 (E)	i) Dystonin: Anchors neural intermediate filaments to the actin cytoskeleton. DST deficient mice have sensory ataxia. ii) BEN domain containing 6: Unknown function.	
45	rs9447700	6-77224806	IMPG1 (N)	Interphotoreceptor matrix proteoglycan 1: A neuronal proteoglycan	
46a	rs9321659	6-100222813	SIM1 (C), MCHR2 (C)	i) Single-minded homolog 1 (Drosophila): Peak expression during neurogenesis in Drosophila. Mutations in severe obesity. ii) Melanin concentrating hormone receptor 2: Orphan G protein-coupled receptor, high affinity binding to the neuropeptide melanin-concentrating hormone (MCH), which regulates energy homeostasis and mood via MCHR1.	Y
46b	rs4840086	6-100315159	SIM1 (C), MCHR2 (C)	(as above)	
46c	rs13196561	6-100866891	SIM1 (N,C), MCHR2 (C)	(as above)	
46d	rs239198	6-101240798	SIM1 (C), ASCC3 (N,E,F)	i) Single-minded homolog 1 (Drosophila): Peak expression during neurogenesis in Drosophila. Mutations in severe obesity. ii) Activating signal cointegrator 1 complex subunit 3: DNA helicase, unwinds DNA to allow ALKBH3-mediated DNA repair	
47a	rs4946632	6-105207901	LIN28B (C)	Lin-28 homolog B (C. elegans): Repression of let-7 microRNAs; cell stemness factor	
47b	rs2153127	6-105455237	LIN28B (E,C)	(as above)	
47c	rs7759938	6-105485647	LIN28B (N,C)	(as above)	
48	rs4895808	6-126823127	CENPW (N,E), NCOA7 (C)	i) Centromere protein W: RNA-associated nuclear matrix protein. ii) Nuclear receptor co-activator 7: Enhances transcriptional activity of ESR1, THRB, PPARG, RARA and other nuclear receptors. T1D locus.	Y
49	rs6938574	6-128432673	PTPRK (N)	Protein tyrosine phosphatase, receptor type, K: Negatively regulates the transactivating function of beta-catenin.	
50	rs6933660	6-151845447	ESR1 (C)	Estrogen receptor 1: Essential for sexual development and reproductive function. Locus for Breast cancer and Bone mineral density	Y
51	rs1079866	7-41436618	INHBA (N,C)	Inhibin, beta A: Inhibitor of pituitary FSH secretion	Y
52	rs6964833	7-73739845	GTF2I (N,C)	General transcription factor Iii: Multifunctional phosphoprotein with roles in transcription and signal transduction. Deleted in the early puberty-associated Williams-Beuren syndrome.	
53	rs11767400	7-121947978	CADPS2 (N)	Calcium-dependent secretion activator 2: Deletions and impairment lead to autism by reducing axonal BDNF release.	
54a	rs2688325	8-3754618	CSMD1 (N)	CUB and Sushi multiple domains 1:	
54b	rs7828501	8-4547489	CSMD1 (N)	(as above)	
54c	rs7463166	8-4821198	CSMD1 (N)	(as above)	
55	rs16918254	8-53931766	NPBWR1 (N,C)	Neuropeptides B/W receptor 1: G protein-coupled receptor for neuropeptides B and W, which are implicated in feeding behavior, energy homeostasis, neuroendocrine function and stress response.	Y
56	rs7821178	8-78256392	PEX2 (N)	Peroxisomal biogenesis factor 2: Mutations result in Zellweger syndrome and infantile Refsum disease. Adult height locus.	
57	rs1469039	8-140720961	KCNK9 (N)	Potassium channel, subfamily K: Imprinted in fetal brain, preferential maternal expression. Encodes a two-pore domain potassium channel that regulates the resting membrane potential, firing frequency of neurons and aldosterone secretion.	
58	rs4875053	8-144944399	SCRIB (N), PARP10 (E)	i) Scribbled planar cell polarity protein: Mutations in the severe neural tube defect, craniorachischisis. ii) Poly (ADP-ribose) polymerase family, member 10: Regulates gene transcription by altering chromatin organization, possible role in cancer, diabetes, and CVD.	
59a	rs7037266	9-6932940	KDM4C (N)	lysine (K)-specific demethylase 4C: Histone demethylase JMJD2C	
59b	rs913588	9-7164673	KDM4C (N,F,C)	(as above)	
60	rs7865468	9-10264080	PTPRD (N)	Protein tyrosine phosphatase, receptor type, D: May promote neurite growth and regulate neuronal axon guidance	
61	rs7853970	9-85905386	RMI1 (N), NTRK2 (C)	i) RecQ mediated genome instability 1, homolog (S. cerevisiae): Component of the RMI complex, limits DNA crossover formation. ii) Neurotrophic tyrosine kinase, receptor, type 2: Receptor for BDNF. Mutations associated with obesity and mood disorders	
62a	rs10816359	9-107797491	TMEM38B (N)	Transmembrane protein 38B: Intracellular monovalent cation channel. Regulates intracellular calcium release. Mutations in osteogenesis imperfecta.	
62b	rs10453225	9-107960041	TMEM38B (N)	(as above)	
62c	rs10739221	9-108100651	TMEM38B (N)	(as above)	
63	rs11792861	9-110849116	TMEM245 (N,E)	Transmembrane protein 245: Unknown function	
64	rs10980854	9-113090178	ZNF483 / OR2K2 (N)	i) Zinc finger protein 483: May be involved in transcriptional regulation. ii) Olfactory receptor, family 2, subfamily K, member 2: G-protein-coupled receptor which triggers the perception of smell	
64	rs10980921	9-113319733	ZNF483 / OR2K2 (N)	(as above)	
65	rs1874984	10-1721871	ADARB2 (N)	Adenosine deaminase B2: Regulatory role in RNA editing. Candidate gene for longevity in humans and in C. elegans.	

Supplementary Table 8 (continued) | Candidate genes at or near menarche loci.

Locus	SNP	Location	Consensus Gene	Gene name: function	Role in Hormone Function
66	rs12571664	10-121698919	SEC23IP (N,E)	SEC23 interacting protein: Facilitates endoplasmic reticulum export. Implicated in Waardenburg syndrome	
67	rs1915146	10-126836204	CTBP2 (N,C)	C-terminal binding protein 2: Transcriptional repressor. Expression associated with decreased PTEN expression and PI3-kinase pathway activation. Coactivator of RAR/RXR signalling	
68	rs7104764	11-219977	SIRT3 (N,E,C)	Sirtuin 3: Unknown function in humans. Induced by caloric restriction, considered to be anti-ageing.	
69	rs4929947	11-8596570	TRIM66 (N,E,F)	Tripartite motif containing 66: May function as a transcription repressor. BMI locus	
70	rs11022756	11-13272015	ARNTL (N), PTH (C)	Aryl hydrocarbon receptor nuclear translocator-like: Forms a heterodimer with CLOCK to activate circadian rhythym-associated genes. Locus for PAI-1. ii) Parathyroid hormone: Regulates calcium metabolism.	Y
71	rs7103411	11-27656701	BDNF (N,C), LGR4 (C)	Brain-derived neurotrophic factor: Nerve growth factor. Regulation of stress response and mood. BMI locus. ii) Leucine-rich repeat containing G protein-coupled receptor 4: key regulator of stem cell differentiation via SOX2. Mutations in late menarche.	
72	rs16918636	11-29080758	FSHB (N[~1mb],C)	Follicle stimulating hormone, beta polypeptide: Beta subunit of follicle-stimulating hormone.	Y
73	rs4756059	11-46107195	PHF21A (N)	PHD finger protein 21A: Component of a BRAF35/histone deacetylase complex that represses neuron-specific genes	
74	rs2063730	11-77726172	GAB2 (N), THRSP (C)	i) GRB2-associated binding protein 2: Encodes the principal activator of PI3-kinase. ii) Thyroid hormone responsive: Biosynthesis of triglycerides with medium-length fatty acid chains. May modeulate the activity of THRB.	Y
75	rs10895140	11-100941931	TRPC6 (N), PGR (C)	Transient receptor potential cation channel, subfamily C, member 6: PI3/PTEN pathway and calcium signalling, activated by diacylglycerol. Mutations in focal segmental glomerulosclerosis 2. ii) Progesterone receptor: Mediates the effects of the reproductive hormone progesterone.	Y
76	rs11215400	11-114557845	CADM1 (N)	Cell adhesion molecule 1: Possible driver of synapse assembly neuronal migration, axon growth, and pathfinding.	
77	rs1461503	11-122350285	BSX (N,C)	Brain specific homebox: DNA binding protein and transcriptional activator. Expressed specifically in mouse pineal gland, telencephalic septum, hypothalamic pre-mammillary body and arcuate nucleus. Is necessary for postnatal growth.	
78	rs7955374	12-46166416	VDR (C)	Vitamin D (1,25- dihydroxyvitamin D3) receptor: Nuclear hormone receptor for vitamin D3	Y
79	rs7138803	12-48533735	BCDIN3D (N)	BCDIN3 domain containing: RNA methyltransferase, regulates microRNA-145 processing. BMI locus	
80	rs6563739	13-39137785	COG6 (N,E)	Component of oligomeric golgi complex 6: Maintains normal structure and activity of the Golgi apparatus	
81	rs1324913	13-73533589	KLF12 (N)	Kruppel-like factor 12: Locus for phospho- and sphingolipids; overexpression represses secretion of prolactin and IGFBP1	Y
82	rs9560113	13-110981349	TEX29 (N)	Testis expressed 29: Unknown function.	
83	rs1254337	14-59990278	SIX6 (N)	SIX homeobox 6: Homeobox protein involved in eye development. Mutations in isolated microphthalmia with cataract type 2.	
84	rs1958560	14-65106548	FUT8 (N,E)	Fucosyltransferase 8: Encodes alpha-1,6-Fucosyltransferase, involved in the biosynthesis of asparagine-linked glycoprotein oligosaccharides.	
85a	rs10144321	14-99952158	DLK1 (C),	Delta-like 1 homolog (Drosophila): Epidermal growth factor involved in cell differentiation. Imprinted fetal growth gene with preferential paternal expression. Maternal UPD14 is associated with growth retardation and advanced puberty	
85b	rs7141210	14-100252223	DLK1 (N,E,C)	(as above)	
86	rs12148769	15-21703187	MKRN3 (C), MAGEL2 (C)	i) Makorin ring finger protein 3: Deletions in precocious puberty. ii) Melanoma Antigen Family (MAGE) - like 2: patients with truncating mutations on the paternal allele have clinical and behavioural features of Prader Willi syndrome. NDN, MKRN3 and MAGEL2 are imprinted genes with paternal specific expression, in the Prader-Willi syndrome deleted region.	Y
87	rs3743266	15-58568805	RORA (N,C)	RAR-related orphan receptor A: Nuclear hormone receptor; unknown function.	
88	rs8032675	15-65746518	MAP2K5 (N)	Mitogen-activated protein kinase kinase 5: Activates MAPK7/ERK5, involved in growth factor stimulated cell proliferation. BMI locus	
89	rs12915845	15-86843471	DET1 (N,E)	De-Etiolated Homolog 1 (Arabidopsis): Component of the E3 ubiquitin ligase DCX DET1-COP1 complex, required for ubiquitination and degradation of target proteins.	
90	rs246185	16-14302933	MKL2 (N)	MKL/myocardin-like 2: Transcriptional coactivator of serum response factor. Required for skeletal myogenic differentiation.	
91	rs12446632	16-19842890	GPRC5B (N,C)	G protein-coupled receptor, family C, group 5, member B: May mediate the cellular effects of retinoic acid. BMI locus	
92	rs1129700	16-29825535	KCTD13 (N), TBX6 (E,C)	Potassium channel tetramerization domain containing 13: Responsible for the micro/macro-cephaly phenotype of 16p11.2. 16p11.2 also has a mirrored obese phenotype due to SH2B1 (but is 1 Mb away).	
93	rs8050136	16-52373776	FTO (N,C)	Fat mass and obesity associated: 2-oxoglutarate-dependent oxygenase. BMI locus	
94a	rs1364063	16-68146073	COG4 (C), NFAT5 (N)	i) Component of oligomeric golgi complex 4: Role in Golgi apparatus function. Mutations may cause glycosylation defect type IIj. ii) Nuclear factor of activated T-cells 5, tonicity-responsive: Regulates gene expression induced by osmotic stress.	
94b	rs929843	16-68603249	COG4 (C), WWP2 (N)	i) Component of oligomeric golgi complex 4: Role in Golgi apparatus function. Mutations may cause glycosylation defect type IIj. ii) WW domain containing E3 ubiquitin protein ligase 2: Ubiquitin protein ligase for PTEN, promotes degradation of pluripotency factor OCT4 in human embyonic stem cells.	
95	rs7215990	17-5975555	WSCD1 (N,E), ALOX15B (E)	i) WSC Domain Containing 1: Unknown function. ii) Arachidonate 15-Lipoxygenase: Metabolises arachidonic acid.	

Supplementary Table 8 (continued) | Candidate genes at or near menarche loci.

Locus	SNP	Location	Consensus Gene	Gene name: function	Role in Hormone Function
96	rs9635759	17-46968784	CA10 (N)	Carbonic anhydrase X: Acatalytic member of the alpha-carbonic anhydrase subgroup. May play a role in brain development.	
97	rs244293	17-50585721	STXBP4 (N,E)	Syntaxin binding protein 4: Insulin-regulated syntaxin 4-binding protein directly involved in the control of glucose transport and GLUT4 vesicle translocation.	
98	rs12607903	18-3807134	DLGAP1 (N)	Discs, large (Drosophila) homolog-associated protein 1: Part of the postsynaptic scaffold in neuronal cells.	
99	rs2137289	18-43006123	SKOR2 (N)	SKI family transcriptional corepressor: Acts as a TGF-beta antagonist in the nervous system.	
100	rs652260	19-7806562	EVI5L (N), RETN (C)	i) Ecotropic viral integration site 5-like: Functions as a GTPase-activating protein with broad specificity. ii) Resistin: Suppresses insulin-mediated glucose uptake by adipocytes.	Y
101	rs889122	19-9856867	OLFM2 (N), RDH8 (C)	i) Olfactomedin 2: Neuronal olfactomedin related ER localized protein. ii) Retinol dehydrogenase 8: Visual cycle enzyme.	
102	rs10423674	19-18678903	CRTC1 (N,C)	CREB regulated transcription coactivator 1: Transcriptional coactivator for CREB1. Murine deletions cause hyperphagia and delayed puberty.	Y
103	rs852069	20-17070593	PCSK2 (N,C)	Proprotein convertase type 2: Prohormone convertase.	Y
104	rs2836950	21-39526299	BRWD1 (N,C)	Bromodomain and WD repeat domain containing 1: Involved in a variety of cellular processes including cell cycle progression, signal transduction, apoptosis, and gene regulation. In the Down syndrome critical region-2. Murine deletions cause impaired oocyte maturation.	Y
105	rs13053505	22-37575564	NPTXR (N,E), CBX7 (C)	i) Neuronal pentraxin receptor: CSF marker of degeneration. ii) Chromobox Homolog 7: Part of the Polycomb group (PcG) of transcriptional silencers that repress the onset of reproductive maturity via Kiss1. Pubertal onset in mice is triggered by DNA methylation of the PcG complex, including at the Cbx7 promotor region, accompanied by decreased hypothalamic Cbx7 expression.	
106	rs6009583	22-48063650	C22orf34 (N)	Chromosome 22 open reading frame 34: Unknown function.	
Gene refers to the consensus gene(s) reported at that locus mapped using 4 approaches: (N) Nearest, (C) Candidate, (F) 1000 Genomes missense variant in high LD (r2 >0.8), (E) gene expression linked by eQTL.					

Supplementary Table 9 | Association of menarche signals with BMI and height in the GIANT consortium.

			Consensus Gene	Raising	Menarche	Association of menarche raising allele with BMI			Association of menarche raising allele with height		
Locus	SNP	Location		Allele	Other Allele	N	Direction	p value	N	Direction	p value
1	rs2274465	1-43894144	KDM4A (N,C), PTPRF (E,C)	c	g	123824	+	0.815	133792	-	0.402
2	rs10789181	1-65589155	LEPR (C)	a	g	123859	-	**0.023**	133847	-	0.505
3	rs3101336	1-72523773	NEGR1 (N,C)	t	c	123796	-	**2.130E-14**	133721	+	0.780
4	rs7514705	1-74779308	TNNI3K (N), TYW3 (E)	c	t	123843	-	**1.940E-09**	133728	+	0.427
5	rs11165924	1-98148036	DPYD (N)	a	g	119717	+	0.792	127891	-	0.827
6	rs11578152	1-102349609	OLFM3 (N)	g	a	123849	-	0.668	133823	+	0.085
7	rs466639	1-163661506	RXRG (N,C)	c	t	123858	-	0.084	133844	+	0.480
8	rs543874	1-176156103	SEC16B (N)	a	g	123863	-	**1.660E-13**	133853	-	0.412
9	rs6427782	1-198064962	NR5A2 (N,C)	a	g	123863	+	0.269	132043	+	0.453
10	rs951366	1-203951975	NUCKS1 (N,E), RAB7L1 (E)	t	c	123836	-	**0.027**	133814	-	**4.503E-04**
11	rs2947411	2-604168	TMEM18 (N,C)	a	g	123744	-	**1.350E-21**	133719	-	0.305
12	rs6747380	2-56441253	CCDC85A (N)	a	g	123791	+	0.555	133756	+	0.314
13	rs268067	2-59734549	BCL11A (N[~800kb])	a	g	123854	-	**0.008**	133792	-	0.780
14	rs6758290	2-105231258	GPR45 (N)	t	c	123838	-	0.321	133828	+	0.502
15	rs12472911	2-141944979	LRP1B (N)	c	t	123272	-	**0.003**	133224	-	0.066
16	rs17236969	2-156460705	NR4A2 (N,C)	t	c	120221	+	0.181	128329	+	0.086
16	rs4369815	2-156835210	NR4A2 (N,C)	t	g	123429	+	0.716	133404	+	**0.021**
17a	rs1400974	2-199346935	SATB2 (N)	a	g	123854	+	0.883	133794	+	**0.024**
17b	rs17233066	2-199352283	SATB2 (N)	c	t	118403	-	0.292	125500	+	0.939
17c	rs17266097	2-199983454	SATB2 (N)	t	c	123849	+	0.931	132029	+	**0.043**
18	rs6770162	3-24686017	THRB (N,C)	a	g	123853	-	0.259	133787	-	0.217
19	rs6762477	3-50068213	WDR6 (E,C), UBA7 (C)	g	a	67240	+	**0.015**	75788	-	0.859
19	rs7647973	3-49485935	WDR6 (E,C), UBA7 (C)	a	g	123864	+	0.950	133847	+	0.546
20	rs7642134	3-86999572	POU1F1 (PIT1) (C)	g	a	123862	+	0.143	133832	+	0.675
21	rs9849248	3-88323964	ZNF654 (N,E,F), HTR1F (C)	c	t	123866	-	**0.008**	133839	-	0.573
22	rs11715566	3-119045126	IGSF11 (N[~1Mb])	t	c	123863	-	0.099	133773	+	**0.004**
23	rs2687729	3-129377916	EEFSEC (N,E)	g	a	123852	-	0.353	133832	-	0.905
24	rs2600959	3-134098154	ACAD11 (E)	a	g	123861	-	0.166	132041	-	0.668
25	rs13067731	3-138472681	IL20RB (N)	t	c	123864	+	0.093	133763	-	**0.009**
26	rs900400	3-158281469	LEKR1 (N,E), CCNL1 (C)	t	c	123863	+	0.560	133748	+	0.706
27	rs939317	3-185528493	EIF4G1 (N)	g	a	123858	-	**0.002**	132038	-	**0.035**
28	rs16860328	3-187118379	TRA2B (N), IGF2BP2 (C)	g	a	123851	+	0.792	133832	+	**2.569E-04**
29	rs1038903	4-28361152	PCDH7 (N[~2Mb])	t	c	123863	+	0.526	133824	+	0.264
30	rs10938397	4-44877284	GNPDA2 (N)	a	g	123849	-	**4.350E-17**	133824	-	0.367
31	rs13135934	4-95426711	SMARCAD1 (N,E,F)	c	g	123863	-	0.164	133854	+	0.757
32	rs3733631	4-104860552	TACR3 (N,C)	c	g	123864	+	0.691	133850	+	0.172
33	rs1532331	5-43152587	ZNF131 (N,E,C), GHR (C)	g	t	123551	-	**0.034**	133562	+	0.198
34	rs17086188	5-95871610	PCSK1 (N,C)	a	g	118639	-	**0.028**	128751	+	0.207
35	rs251130	5-110887696	STARD4 (N,E,C)	g	a	123855	-	0.071	133766	+	**0.002**
36	rs13179411	5-133928412	PHF15 (N), TCF7 (E)	t	g	123862	-	0.322	133784	+	**0.004**
37	rs17171818	5-137752902	KDM3B (N,C), BRD8 (C)	c	t	123853	-	**9.540E-05**	132033	-	0.709
38	rs7701886	5-153527602	GALNT10 (N)	a	g	123864	-	**1.570E-05**	133815	+	0.270
39	rs9647570	5-167302841	TENM2 (N,C)	g	t	123861	-	0.364	133852	-	0.361
40	rs6555855	5-168682315	SLIT3 (N)	g	a	123858	-	0.592	133755	+	0.649
41	rs16896742	6-30030719	HLA-A (N)	g	a	120610	-	0.383	128786	+	0.307
42	rs2479724	6-41998960	BYSL (N,E), FRS3 (C)	t	c	123864	+	0.262	133795	+	**0.001**
43	rs988913	6-54864267	FAM83B (N), HCRTR2 (C)	c	t	123852	+	**0.013**	133837	+	**0.035**
44	rs9475752	6-56888700	DST (N), BEND6 (E)	c	t	123865	-	0.738	133855	+	**0.010**
45	rs9447700	6-77224806	IMPG1 (N)	c	t	123864	-	0.585	133851	+	0.075
46a	rs9321659	6-100222813	SIM1 (C), MCHR2 (C)	a	g	120491	-	0.384	130475	+	0.233
46b	rs4840086	6-100315159	SIM1 (C), MCHR2 (C)	a	g	123864	-	0.196	133837	+	**0.032**
46c	rs13196561	6-100866891	SIM1 (N,C), MCHR2 (C)	c	a	123854	-	0.175	132863	-	0.433
46d	rs239198	6-101240798	SIM1 (C), ASCC3 (N,E,F)	t	c	123818	-	0.506	133801	+	0.094
47a	rs4946632	6-105207901	LIN28B (C)	c	t	123817	+	0.596	133763	+	0.055
47b	rs2153127	6-105455237	LIN28B (E,C)	t	c	123848	-	0.415	133828	+	**1.380E-07**
47c	rs7759938	6-105485647	LIN28B (N,C)	c	t	123854	-	0.823	133774	+	**8.690E-18**
48	rs4895808	6-126823127	CENPW (N,E), NCOA7 (C)	c	t	123864	-	0.974	133837	-	**2.250E-14**
49	rs6938574	6-128432673	PTPRK (N)	t	c	123863	+	0.683	133847	+	0.847
50	rs6933660	6-151845447	ESR1 (C)	c	a	123604	-	**0.030**	131689	-	0.857
51	rs1079866	7-41436618	INHBA (N,C)	g	c	123855	+	0.393	133842	+	**0.015**
52	rs6964833	7-73739845	GTF2I (N,C)	t	c	93255	-	**0.046**	102029	+	0.314
53	rs11767400	7-121947978	CADPS2 (N)	a	c	123858	-	0.466	133765	+	0.188
54a	rs2688325	8-3754618	CSMD1 (N)	t	c	123862	+	0.925	133833	+	0.236
54b	rs7828501	8-4547489	CSMD1 (N)	g	a	123852	+	0.133	133759	+	0.310
54c	rs7463166	8-4821198	CSMD1 (N)	a	g	123860	-	0.211	133849	+	**0.006**
55	rs16918254	8-53931766	NPBWR1 (N,C)	a	g	123797	-	0.226	133782	-	**0.023**
56	rs7821178	8-78256392	PEX2 (N)	c	a	123438	+	0.881	133260	-	**1.580E-06**
57	rs1469039	8-140720961	KCNK9 (N)	a	g	123853	-	0.128	132944	+	0.124
58	rs4875053	8-144944399	SCRIB (N), PARP10 (E)	g	c	67234	-	**0.048**	73984	-	0.091
59a	rs7037266	9-6932940	KDM4C (N)	a	c	123863	-	**0.004**	133831	-	0.533
59b	rs913588	9-7164673	KDM4C (N,F,C)	g	a	123795	-	0.236	133768	+	0.377
60	rs7865468	9-10264080	PTPRD (N)	a	g	123859	-	0.570	133737	+	0.487

Supplementary Table 9 (continued) | Association of menarche signals with BMI and height in the GIANT consortium.

			Consensus Gene	Raising	Menarche	Association of menarche raising allele with BMI			Association of menarche raising allele with height		
Locus	SNP	Location		Allele	Other Allele	N	Direction	p value	N	Direction	p value
61	rs7853970	9-85905386	RMI1 (N), NTRK2 (C)	t	c	123841	-	0.076	132021	+	0.167
62a	rs10816359	9-107797491	TMEM38B (N)	t	g	123861	-	0.068	132041	+	1.000
62b	rs10453225	9-107960041	TMEM38B (N)	g	t	123863	-	**0.013**	133832	+	**3.022E-05**
62c	rs10739221	9-108100651	TMEM38B (N)	c	t	123863	-	**0.004**	133818	+	**0.009**
63	rs11792861	9-110849116	TMEM245 (N,E)	a	c	123864	+	**0.023**	133821	+	**0.007**
64	rs10980854	9-113090178	ZNF483 / OR2K2 (N)	a	g	123300	-	0.077	133251	+	0.176
64	rs10980921	9-113319733	ZNF483 / OR2K2 (N)	c	t	123805	-	0.477	133779	+	**0.001**
65	rs1874984	10-1721871	ADARB2 (N)	c	g	123841	-	0.658	132021	+	0.630
66	rs12571664	10-121698919	SEC23IP (N,E)	t	c	123864	-	0.636	133753	+	0.187
67	rs1915146	10-126836204	CTBP2 (N,C)	g	a	123836	-	0.874	133768	+	**0.004**
68	rs7104764	11-219977	SIRT3 (N,E,C)	g	a	123865	-	0.219	133845	+	**0.015**
69	rs4929947	11-8596570	TRIM66 (N,E,F)	g	c	123846	-	**2.040E-06**	133818	+	0.344
70	rs11022756	11-13272015	ARNTL (N), PTH (C)	a	c	123858	-	**0.014**	133837	+	**0.007**
71	rs7103411	11-27656701	BDNF (N,C), LGR4 (C)	c	t	123864	-	**9.150E-13**	133828	+	0.597
72	rs16918636	11-29080758	FSHB (N[~1mb],C)	t	c	123859	-	**0.001**	133787	+	0.382
73	rs4756059	11-46107195	PHF21A (N)	t	c	123818	+	0.506	133808	+	**0.022**
74	rs2063730	11-77726172	GAB2 (N), THRSP (C)	c	a	123865	-	**0.003**	132045	+	0.841
75	rs10895140	11-100941931	TRPC6 (N), PGR (C)	g	a	123864	-	0.624	133798	+	0.576
76	rs11215400	11-114557845	CADM1 (N)	c	a	116688	-	**0.005**	126566	+	0.746
77	rs1461503	11-122350285	BSX (N,C)	c	a	123863	-	0.614	133805	+	**4.144E-04**
78	rs7955374	12-46166416	VDR (C)	t	c	123118	+	0.678	131291	+	**0.011**
79	rs7138803	12-48533735	BCDIN3D (N)	g	a	123799	-	**3.960E-11**	133757	-	0.176
80	rs6563739	13-39137785	COG6 (N,E)	g	t	123864	-	0.050	133855	+	0.078
81	rs1324913	13-73533589	KLF12 (N)	g	t	123837	-	0.944	133756	+	0.747
82	rs9560113	13-110981349	TEX29 (N)	g	a	123858	-	0.098	133816	-	0.845
83	rs1254337	14-59990278	SIX6 (N)	t	a	123864	+	0.896	133845	+	**5.050E-10**
84	rs1958560	14-65106548	FUT8 (N,E)	a	g	123864	-	0.087	133676	+	0.209
85a	rs10144321	14-99952158	DLK1 (C),	a	g	123864	-	0.389	133766	+	**0.039**
85b	rs7141210	14-100252223	DLK1 (N,E,C)	t	c	123858	-	0.981	133802	+	0.115
86	rs12148769	15-21703187	MKRN3 (C), MAGEL2 (C)	g	a	123855	+	0.754	133745	+	0.073
87	rs3743266	15-58568805	RORA (N,C)	t	c	123689	-	0.908	133613	+	**0.042**
88	rs8032675	15-65746518	MAP2K5 (N)	t	c	123730	-	**4.120E-07**	133689	+	0.757
89	rs12915845	15-86843471	DET1 (N,E)	c	t	123852	+	0.913	133839	+	0.061
90	rs246185	16-14302933	MKL2 (N)	c	t	123849	+	0.321	132029	+	**7.510E-06**
91	rs12446632	16-19842890	GPRC5B (N,C)	a	g	123853	-	**4.610E-11**	133795	+	0.072
92	rs1129700	16-29825535	KCTD13 (N), TBX6 (E,C)	t	c	119582	-	0.206	127211	-	0.331
93	rs8050136	16-52373776	FTO (N,C)	c	a	123729	-	**1.040E-59**	133662	+	0.055
94a	rs1364063	16-68146073	COG4 (C), NFAT5 (N)	c	t	123864	-	**0.034**	133850	+	**5.913E-05**
94b	rs929843	16-68603249	COG4 (C), WWP2 (N)	a	c	123859	-	0.227	132039	+	**0.001**
95	rs7215990	17-5975555	WSCD1 (N,E), ALOX15B (E)	g	a	123848	+	0.974	133836	+	0.502
96	rs9635759	17-46968784	CA10 (N)	a	g	123843	-	0.122	132023	+	0.412
97	rs244293	17-50585721	STXBP4 (N,E)	g	a	123863	-	**0.009**	133808	+	0.300
98	rs12607903	18-3807134	DLGAP1 (N)	c	t	123855	-	0.728	132035	+	0.119
99	rs2137289	18-43006123	SKOR2 (N)	a	g	123862	+	0.894	133786	+	0.061
100	rs652260	19-7806562	EVI5L (N), RETN (C)	t	c	123795	-	0.978	131952	+	**0.036**
101	rs889122	19-9856867	OLFM2 (N), RDH8 (C)	g	t	123783	-	0.508	133721	+	0.765
102	rs10423674	19-18678903	CRTC1 (N,C)	a	c	123825	-	**0.016**	131993	+	0.489
103	rs852069	20-17070593	PCSK2 (N,C)	g	a	123795	-	0.879	131973	-	0.621
104	rs2836950	21-39526299	BRWD1 (N,C)	c	g	123407	+	0.823	131459	+	0.135
105	rs13053505	22-37575564	NPTXR (N,E), CBX7 (C)	g	t	123900	-	0.124	132035	+	**0.016**
106	rs6009583	22-48063650	C22orf34 (N)	c	t	122954	+	0.105	132868	+	0.985

Supplementary Note

1. Acknowledged consortia members and affiliations

Early Growth Genetics (EGG) Consortium

Diana L. Cousminer[1], Evangelia Stergiakouli[2], Diane J. Berry[3], Wei Ang[4], Maria M.Groen-Blokhuis[5,6], Antje Körner[7], Niina Siitonen[8], Ioanna Ntalla[9,10], Marcella Marinelli[11,12,13], John R. B. Perry[14], Johannes Kettunen[1,15], Rick Jansen[16,17], Ida Surakka[1,15], Nicholas J. Timpson[2], Susan Ring[18], George McMahon[18], Chris Power[3], Carol Wang[4], Mika Kähönen[19], Jorma Viikari[20], Terho Lehtimäki[21], Christel M. Middeldorp[5,16,17], Hilleke E. Hulshoff Pol[22], Madlen Neef[7], Sebastian Weise[7], Katja Pahkala[8,23], Harri Niinikoski[8,24], Eleftheria Zeggini[25], Kalliope Panoutsopoulou[25], Mariona Bustamante[11,12,13], Brenda W. J. H. Penninx[6,16,17], the ReproGen Consortium[33], Joanne Murabito[26], Maties Torrent[13], George V. Dedoussis[9], Wieland Kiess[7], Dorret I. Boomsma[5,6,17], Craig E. Pennell[4], Olli T. Raitakari[8,27], Elina Hyppönen[3,28], George Davey Smith[2], Samuli Ripatti[1,25,29], Mark I. McCarthy[30,31,32], and Elisabeth Widén*[1]

[1]Institute for Molecular Medicine, Finland (FIMM), University of Helsinki, Helsinki, Finland
[2]MRC Integrative Epidemiology Unit at the University of Bristol, Bristol, UK
[3]Centre for Paediatric Epidemiology and Biostatistics, UCL Institute of Child Health, London, UK
[4]School of Women's and Infants' Health, The University of Western Australia, Perth, WA, Australia
[5]Department of Biological Psychology, VU University, Amsterdam, the Netherlands
[6]EMGO+ Institute for Health and Care Research, VU University, Amsterdam, the Netherlands
[7]Center of Pediatric Research, Dept. of Women´s & Child Health, University of Leipzig, Germany
[8]Research Centre of Applied and Preventive Cardiovascular Medicine, University of Turku, Finland
[9]Department of Nutrition and Dietetics, Harokopio University of Athens, Greece
[10]University of Leicester, Genetic Epidemiology Group, Department of Health Sciences, Leicester, UK
[11]Center for Research in Environmental Epidemiology (CREAL), Barcelona, Catelonia, Spain
[12]Hospital del Mar Research Institute (IMIM), Barcelona, Catalonia, Spain
[13]Spanish consortium for Research on Epidemiology and Public Health (CIBERESP), Barcelona, Catalonia, Spain
[14]MRC Epidemiology Unit, Institute of Metabolic Science, Addenbrooke's Hospital, Cambridge, United Kingdom
[15]Department of Chronic Disease Prevention, National Institute for Health and Welfare, Helsinki, Finland
[16]Department of Psychiatry, VU medical center / GGZ inGeest, Amsterdam, the Netherlands
[17]Neuroscience Campus Amsterdam, VU University, Amsterdam, the Netherlands
[18]Avon Longitudinal Study of Parents and Children (ALSPAC), School of Social and Community Medicine, University of Bristol, Bristol, UK
[19]Department of Clinical Physiology, Tampere University Hospital and University of Tampere School of Medicine, Tampere 33521, Finland
[20]Department of Medicine, University of Turku and Turku University Hospital, Turku 20521, Finland
[21]Department of Clinical Chemistry, Fimlab Laboratories and University of Tampere School of Medicine, Tampere 33520, Finland
[22]Brain Center Rudolf Magnus, University Medical Center Utrecht, Department of Psychiatry, the Netherlands
[23]Paavo Nurmi Centre, Sports & Exercise Medicine Unit, Department of Physical Activity and Health, University of Turku, Finland
[24]Department of Pediatrics, University of Turku, Turku, Finland
[25]Wellcome Trust Sanger Institute, Cambridge, United Kingdom
[26]Department of Medicine, Section of General Internal Medicine, Boston University School of Medicine, Boston, MA, USA
[27]Department of Clinical Physiology and Nuclear Medicine, Turku University Hospital, Turku, Finland
[28]School of Population Health, University of South Australia, North Terrace, Adelaide, Australia
[29]Hjelt Institute, University of Helsinki, Helsinki, Finland
[30]Oxford Centre for Diabetes, Endocrinology and Metabolism, University of Oxford, Churchill Hospital, Old Road, Headington, Oxford, United Kingdom
[31]Wellcome Trust Centre for Human Genetics, University of Oxford, Oxford, United Kingdom
[32]Oxford NIHR Biomedical Research Centre, Churchill Hospital, Oxford, United Kingdom

LifeLines Cohort Study

Behrooz Z Alizadeh (1), Rudolf A de Boer (2), H Marike Boezen (1), Marcel Bruinenberg (3), Lude Franke (4), Pim van der Harst (2), Hans L Hillege (1,2), Melanie M van der Klauw (5), Gerjan Navis (6), Johan Ormel (7), Dirkje S Postma (8), Judith GM Rosmalen (7), Joris P Slaets (9), Harold Snieder (1), Ronald P Stolk (1), Bruce HR Wolffenbuttel (5), Cisca Wijmenga (4)

(1) Department of Epidemiology, University of Groningen, University Medical Center Groningen, The Netherlands
(2) Department of Cardiology, University of Groningen, University Medical Center Groningen, The Netherlands
(3) LifeLines Cohort Study, University of Groningen, University Medical Center Groningen, The Netherlands
(4) Department of Genetics, University of Groningen, University Medical Center Groningen, The Netherlands
(5) Department of Endocrinology, University of Groningen, University Medical Center Groningen, The Netherlands
(6) Department of Internal Medicine, Division of Nephrology, University of Groningen, University Medical Center Groningen, The Netherlands
(7) Interdisciplinary Center of Psychopathology of Emotion Regulation (ICPE), Department of Psychiatry, University of Groningen, University Medical Center Groningen, The Netherlands
(8) Department of Pulmonology, University of Groningen, University Medical Center Groningen, The Netherlands
(9) University Center for Geriatric Medicine, University of Groningen, University Medical Center Groningen, The Netherlands

InterAct Consortium

Nita G Forouhi(1), Nicola D Kerrison(1), Claudia Langenberg(1), Robert A Scott(1), Stephen J Sharp(1), Matt Sims(1), Inês Barroso(2,3), Panos Deloukas(2), Mark I McCarthy(4,5,6), Larraitz Arriola(7,8,9), Beverley Balkau(10,11), Aurelio Barricarte(12,9), Heiner Boeing(13), Paul W Franks(14,15), Carlos Gonzalez(16), Sara Grioni(17), Rudolf Kaaks(18), Timothy J Key(19), Carmen Navarro(20,9,21), Peter M Nilsson(14), Kim Overvad(22,23), Domenico Palli(24), Salvatore Panico(25), J. Ramón Quirós(26), Olov Rolandsson(15), Carlotta Sacerdote(27,28), María-José Sánchez(29,9,30), Nadia Slimani(31), Anne Tjonneland(32), Rosario Tumino(33,34), Daphne L van der A(35), Yvonne T van der Schouw(36), Elio Riboli(37), Nicholas J Wareham(1)

(1) MRC Epidemiology Unit, University of Cambridge, Cambridge, United Kingdom, (2) The Wellcome Trust Sanger Institute, Cambridge, United Kingdom, (3) University of Cambridge Metabolic Research Laboratories, Cambridge, UK, (4) Oxford Centre for Diabetes, Endocrinology and Metabolism (OCDEM), University of Oxford, UK, (5) Wellcome Trust Centre for Human Genetics, University of Oxford, Oxford, UK, (6) Oxford NIHR Biomedical Research Centre, Oxford, UK, (7) Public Health Division of Gipuzkoa, San Sebastian, Spain, (8) Instituto BIO-Donostia, Basque Government, San Sebastian, Spain, (9) CIBER Epidemiología y Salud Pública (CIBERESP), Spain, (10) Inserm, CESP, U1018, Villejuif, France, (11) Univ Paris-Sud, UMRS 1018, Villejuif, France, (12) Navarre Public Health Institute (ISPN), Pamplona, Spain, (13) German Institute of Human Nutrition Potsdam-Rehbruecke, Germany, (14) Lund University, Malmö, Sweden, (15) Umeå University, Umeå, Sweden, (16) Catalan Institute of Oncology (ICO), Barcelona, Spain, (17) Epidemiology and Prevention Unit, Milan, Italy, (18) German Cancer Research Centre (DKFZ), Heidelberg, Germany, (19) University of Oxford, United Kingdom, (20) Department of Epidemiology, Murcia Regional Health Council, Murcia, Spain, (21) Unit of Preventive Medicine and Public Health, School of Medicine, University of Murcia, Spain, (22) Department of Public Health, Section for Epidemiology, Aarhus University, Aarhus, Denmark, (23) Aalborg University Hospital, Aalborg, Denmark, (24) Cancer Research and Prevention Institute (ISPO), Florence, Italy, (25) Dipartimento di Medicina Clinica e Chirurgia, Federico II University, Naples, Italy, (26) Public Health Directorate, Asturias, Spain, (27) Unit of Cancer Epidemiology, Citta' della Salute e della Scienza Hospital-University of Turin and Center for Cancer Prevention (CPO), Torino, Italy, (28) Human Genetics Foundation (HuGeF), Torino, Italy, (29) Andalusian School of Public Health, Granada, Spain, (30) Instituto de Investigación Biosanitaria de Granada (Granada.ibs), Granada (Spain), (31) International Agency for Research on Cancer, Lyon, France, (32) Danish Cancer Society Research Center, Copenhagen, Denmark, (33) ASP Ragusa, Italy, (34) Aire Onlus, Ragusa, Italy, (35) National Institute for Public Health and the Environment (RIVM), Bilthoven, The Netherlands, (36) University Medical Center Utrecht, Utrecht, the Netherlands, (37) School of Public Health, Imperial College London, UK

Australian Ovarian Cancer Study (AOCS)
David D Bowtell[1], Adele C Green[2], Georgia Chenevix-Trench[2], Anna deFazio[3], Dorota Gertig[4], Penelope M Webb[2].

[1] Peter MacCallum Cancer Centre, St Andrews Place, East Melbourne, Victoria, Australia
[2] QIMR Berghofer Medical Research Institute, Brisbane, Australia
[3]Westmead Institute for Cancer Research, Westmead, New South Wales, Australia
[4] Victorian Cervical Cytology Registry, Carlton South Victoria, Australia

Gene Environment Interaction and Breast Cancer in Germany (GENICA) network Consortium members

Hiltrud Brauch, Christina Justenhoven Dr. Margarete Fischer-Bosch Institute of Clinical Pharmacology, Stuttgart, and University Tübingen, Germany

Ute Hamann Molecular Genetics of Breast Cancer, Deutsches Krebsforschungszentrum (DKFZ), Heidelberg, Germany

Yon-Dschun Ko, Christian Baisch Department of Internal Medicine, Evangelische Kliniken Bonn gGmbH, Johanniter Krankenhaus, Bonn, Germany

Hans-Peter Fischer Institute of Pathology, University of Bonn, Bonn, Germany

Beate Pesch, Sylvia Rabstein, Anne Spickenheuer Institute for Prevention and Occupational Medicine of the German Social Accident Insurance(IPA), Bochum, Germany

Volker Harth Institute and Outpatient Clinic of Occupational Medicine, Saarland University Medical Center and Saarland University Faculty of Medicine, Homburg, Germany

kConFab Consortium members

Morteza Aghmesheh Medical Oncology Department, Illawarra Cancer Care Centre, Wollongong Hospital, Wollongong, NSW 2500
David Amor Genetic Health Services Victoria, Royal Children's Hospital, Melbourne VIC 3050
Lesley Andrews Hereditary Cancer Clinic, Prince of Wales Hospital, Randwick NSW 2031
Yoland Antill Dept. Haem and Medical Oncology, Peter MacCallum Cancer Centre, St Andrews Place, East Melbourne VIC 3002
Shane Armitage Molecular Genetics Lab, Royal Brisbane and Women's Hospital
Leanne Arnold Molecular Genetics Lab, Royal Brisbane and Women's Hospital
Rosemary Balleine Department of Translational Oncology, C/- Department of Medical Oncology, Westmead Hospital, Westmead NSW 2145
Agnes Bankier PO Box 5444, HEIDELBERG WEST, C/o The Austin Hospital, 3081 Australia
Patti Bastick St George Hospital, Medical Oncology Dept, Gray Street, Kogarah NSW 2000, Australia
Jonathan Beesley Queensland Institute of Medical Research, Herston Road, Herston Qld 4002, Australia
John Beilby Pathology Centre, Queen Elizabeth Medical Centre, Nedlands WA 6009
Ian Bennett Silverton Place, 101 Wickham Terrace, Brisbane QLD 4000
Barbara Bennett Hereditary Cancer Clinic, Prince of Wales Hospital, Randwick NSW 2031
Geoffrey Berry Dept of Public Health and Community Medicine, University of Sydney, Sydney NSW 2006
Anneke Blackburn John Curtin School of Medical Research, Australian National University, P.O. Box 334, Canberra ACT 2601
Michael Bogwitz Familial Cancer Centre, The Royal Melbourne Hospital, Grattan Street, Parkville Victoria 3050, Australia
Meagan Brennan NSW Breast Cancer Institute, PO Box 143, Westmead NSW 2145
Melissa Brown Department of Biochemistry, University of Queensland, St. Lucia QLD 4072
Michael Buckley Molecular and Cytogenetics Unit, Prince of Wales Hospital, Randwick NSW 2031

Matthew Burgess Clinical Genetics Service, Austin Health, Victoria 3084, Australia
Jo Burke Royal Hobart Hospital, GPO Box 1061L, Hobart TAS 7001
Phyllis Butow Medical Psychology Unit, Royal Prince Alfred Hospital, Camperdown NSW 2204
Keith Byron Australian Genome Research Facility, Walter & Eliza Hall Medical Research Institute, Royal Melbourne Hospital, Parkville VIC 3050
David Callen Dame Roma Mitchell Cancer Research Laboratories, University of Adelaide/Hanson Institute, P.O. Box 14, Rundle Mall SA 5000
Ian Campbell Peter MacCallum Cancer Centre, St Andrew's Place, East Melbourne VIC 3002
Deepa Chauhan School of Psychology, Brennan McCallum (Building A18), University of Sydney 2006
Georgia Chenevix-Trench Queensland Institute of Medical Research, Royal Brisbane Hospital, Herston QLD 4029
Alice Christian Genetics Department, Central Region Genetics Service, Wellington Hospital, New Zealand
Christine Clarke Westmead Institute for Cancer Research, University of Sydney, Westmead Hospital, Westmead NSW 2145
Alison Colley Department of Clinical Genetics, Liverpool Health Service, PO Box 103, Liverpool NSW 2170
Dick Cotton Mutation Research Centre, St Vincent's Hospital, Victoria Parade, Fitzroy VIC 3065
Ashley Crook Department of Clinical Genetics, Level 3E, Royal North Shore Hospital, St Leonards NSW 2065
James Cui Epidemiology and Preventive Medicine, Monash University, Prahan Vic 3004, Australia
Bronwyn Culling Molecular and Clinical Genetics, Level 1 Building 65, Royal Prince Alfred Hospital, Camperdown NSW 2050
Margaret Cummings Department of Pathology, University of Queensland Medical School, Herston NSW 4006
Sarah-Jane Dawson Molecular Genetics Department, Cambridge University, England
Anna deFazio Dept. Gynaecological Oncology, Westmead Institute for Cancer Research, Westmead Hospital, Westmead NSW 2145
Martin Delatycki Clinical Genetics, Austin Health, Heidelberg Repatriation Hospital, PO Box 5444, Heidelberg West
Vic 3081, Australia
Rebecca Dickson Level 2, Block 51, Royal North Shore Hospital, North Shore NSW 2408
Joanne Dixon Central Regional Genetic Services, Wellington Hospital, Private bag 7902, Wellington, New Zealand
Alexander Dobrovic Molecular Pathology, Department of Pathology, Peter MacCallum Cancer Centre, St Andrew's Place, East Melbourne VIC 3002
Tracy Dudding Hunter Genetics, Hunter Area Health Service, PO Box 84, Waratah, 2298 NSW
Ted Edkins Clinical Chemistry, Princess Margret Hospital for Children, Box D184, Perth WA 6001
Stacey Edwards Department of Biochemistry and Molecular Biology, University of Queensland, St Lucia Qld 4072, Australia
Maurice Eisenbruch Department of Multicultural Health, University of Sydney, NSW 2052
Gelareh Farshid Tissue Pathology, IMVS, Adelaide SA 5000
Susan Fawcett Family Cancer Clinic, Monash Medical Centre, Clayton VIC 3168
Andrew Fellows Molecular Diagnostic Development, Pathology Department, Peter MacCallum Cancer Centre, Melbourne, East Melbourne Vic 3002
Georgina Fenton South West Family Cancer Clinic, Liverpool Hospital, Liverpool BC NSW 1871
Michael Field Royal North Shore Hospital, Level 2, Vindin House, St Leonards NSW 2065
Frank Firgaira GTG, 60 - 66 Hanover Street, Fitzroy, 3065
James Flanagan Epigenetics Unit, Department of Surgery and Oncology, Imperial College London, London W12 0NN, England
Jean Fleming Eskitis Institute of Cell & Molecular Therapies, School of Biomolecular and Biomedical Sciences, Griffith University, Nathan QLD 4111
Peter Fong Medical Oncology Department, Regional Cancer and Blood Services, Level 1 Building 7, Auckland City Hospital, 2 Park Rd. Grafton, Auckland 1023, New Zealand
John Forbes Surgical Oncology, University of Newcastle, Newcastle Mater Hospital, Waratah NSW 2298

Stephen Fox Pathology Department, Level 1, Peter MacCallum Cancer Centre, St Andrew's Place, East Melbourne Vic 3002
Juliet French School of Molecular and Microbial Sciences, University of Queensland, St Lucia Qld 4072
Michael Friedlander Department of Medical Oncology, Prince of Wales Hospital, Randwick NSW 2031
Clara Gaff Victorian Clinical Genetics Service, Royal Melbourne Hospital, Parkville VIC 3052
Mac Gardner Genetic Health Services Victoria, 10th Floor The Murdoch Institute, Royal Children's Hospital, Parkville VIC 3052
Mike Gattas Queensland Clinical Genetic Service, Royal Children's Hospital, Bramston Terrace, Herston QLD 4020
Peter George Clinical Biochemistry Unit, Canterbury Health Labs, PO Box 151, Christchurch, New Zealand
Graham Giles Cancer Epidemiology Centre, Anti Cancer Council of Victoria, 1 Rathdowne Street, Carlton South VIC 3052
Grantley Gill Department of Surgery, Royal Adelaide Hospital, Adelaide SA 5000
Jack Goldblatt Genetic Services Of WA, King Edward Memorial Hospital, 374 Bagot Road, Subiaco WA 6008
Sian Greening Illawarra Cancer Centre, Wollongong Hospital, Private Mail Bag 8808, South Coast Mail Centre, NSW 2521
Scott Grist Department of Haematology and Genetic Pathology, SouthPath , Flinders Medical Centre , SA
Eric Haan Department of Medical Genetics, Women's and Children's Hospital, North Adelaide SA 5006
Kate Hardie Room 430 Bldg 76, School of Chemistry and Molecular Biosciences, University of Queensland, St Lucia QLD 4072
Marion Harris Familial Cancer Clinic, Peter MacCallum Cancer Centre, St Andrews Place, East Melbourne VIC 3002
Stewart Hart Breast and Ovarian Cancer Genetics, Monash Medical Centre, 871 Centre Road, Bentleigh East VIC, 3165
Nick Hayward Queensland Institute for Medical Research, Royal Brisbane Hospital Post Office, Herston QLD 4029
Sue Healey Queensland Institute of Medical Research (QIMR), 300 Herston Road, Herston Qld Q4006
Louise Heiniger Medical Psychology Research Unit, The University of Sydney, Sydney NSW 2006
John Hopper Centre for M.E.G.A. Epidemiology, University of Melbourne, Level 1, 723 Swanston Street, Carlton VIC 3010
Evelyn Humphrey Royal Hobart Hospital, GPO Box 1061L, Hobart TAS 7001
Clare Hunt Southern Health Familial Cancer Centre, Monash Medical Centre, Special Medicine Building, 246 Clayton Rd, Clayton Victoria 3168, Australia
Paul James Genetic Health Sevices, Monash Medical Centre, Clayton Vic
Mark Jenkins Centre for M.E.G.A. Epidemiology, The University of Melbourne, 723 Swanston Street, Carlton VIC 3053
Alison Jones Molecular Genetics Lab, Royal Brisbane and Women's Hospital, QLD
Rick Kefford Medical Oncology, Westmead Hospital, Westmead NSW 2145
Alexa Kidd Clinical Genetics Departments, Central Regional Genetics Service, Wellington Hospital, New Zealand
Belinda Kiely NHMRC Clinical Trials Centre, University of Sydney, Locked Bag 77, Camperdown Sydney NSW 1450
Judy Kirk Familial Cancer Service, Department of Medicine, Westmead Hospital, Westmead NSW 2145
Jessica Koehler Hereditary Cancer Clinic, Prince of Wales Hospital, Randwick NSW 2031
James Kollias Breast Endocrine and Surgical Unit, Royal Adelaide Hospital, North Terrace SA 5000
Serguei Kovalenko Genetic Technologies Limited, 60-66 Hanover Street, Fitzroy Vic 3065
Sunil Lakhani UQ Centre for Clinical Research, Level 6 Building 71/918, University of Queensland, The Royal Brisbane & Women's Hospital Herston, 4029
Amanda Leaming Wesley Breast Clinic, Chasely Street, Auchenflower, Brisbane Qld 4066
Jennifer Leary Familial Cancer Laboratory, Westmead Hospital, Westmead NSW 2145

Jacqueline Lim Dept of Psychological Medicine, Royal North Shore Hospital, St Leonards NSW 2065
Geoff Lindeman Breast Cancer Laboratory, Walter and Eliza Hall Institute, PO Royal Melbourne Hospital, Parkville VIC 3050
Lara Lipton Medical Oncology and Clinical Haematology Unit, Western Hospital, Footscray VIC
Liz Lobb Medical Psychology Research Unit, Room 332, Brennan MacCallum Building (A18), The University of Sydney, Camperdown, 2006
Graham Mann Westmead Institute for Cancer Research, Westmead Millennium Institute, Westmead NSW 2145
Deborah Marsh Kolling Institute of Medical Research, Royal North Shore Hospital, St Leonards NSW 2065
Sue Anne McLachlan Department of Oncology, St Vincent's Hospital, 41 Victoria Parade, Fitzroy VIC 3065
Bettina Meiser Hereditary Cancer Clinic, Prince of Wales Hospital, Randwick NSW 2031
Cliff Meldrum Molecular Pathology Dept, 1st Floor, Peter MacCallum Cancer Centre, St Andrew's Place, East Melbourne Vic 3002
Roger Milne Centro Nacional de Investigaciones Oncologicas, C/ Melchor Fernández Almagro, 3, E-28029 Madrid, Spain
Gillian Mitchell Family Cancer Clinic, Peter MacCallum Cancer Centre, St Andrew's Place, East Melbourne VIC 3002
Beth Newman School of Public Health Road, Queensland University of Technology, Victoria Park, Kelvin Grove QLD 4059
Shona O'Connell Southern Health Familial Cancer Centre, Special Medicine Building, 246 Clayton Road, Clayton Vic 3168
Imelda O'Loughlin St Vincent's Breast Clinic, PO Box 4751, Toowoomba QLD 4350
Richard Osborne Dept of Public Health and Community Medicine, 200 Berkeley Street, Carlton VIC 3053
Nick Pachter Familial Cancer and Clinical Genetics, Royal Melbourne Hospital, Grattan Street, Parkville VIC 3050, Australia
Briony Patterson Tas Clinical Genetics Service, Royal Hobart Hospital, GPO Box 1061, Hobart Tasmania 7001, Australia
Lester Peters Radiation Oncology, Peter MacCallum Cancer Centre, St Andrew's Place, East Melbourne VIC 3002
Kelly Phillips Department of Medical Oncology, Peter MacCallum Cancer Centre, St Andrew's Place, East Melbourne VIC 3002
Melanie Price Medical Psychology, University of Sydney, Sydney, 2006
Lynne Purser The Centre for Genetics Education NSW Health, PO Box 317, St Leonards NSW 1590, Australia
Jeanne Reeve Northern Regional Genetic Service, Auckland Hospital, New Zealand
Tony Reeve Cancer Genetics Laboratory, University of Otago, PO Box 56, Dunedin, New Zealand
Robert Richards Dept of Cytogenetics and Molecular Genetics, Women and Children's Hospital, Adelaide SA 5006
Edwina Rickard Familial Cancer centre, Westmead Hospital, Westmead NSW 2145
Bridget Robinson Oncology Service, Christchurch Hospital, Private Bag 4710, Christchurch, New Zealand
Barney Rudzki Molecular Pathology Department, The University of Melbourne, Parkville Vic 3050
Mona Saleh Centre for Genetic Education, Prince of Wales Hospital, Randwick NSW 2031
Elizabeth Salisbury Anatomical Pathology, UNSW, Prince of Wales Hospital, Randwick, 2031 NSW
Joe Sambrook Peter MacCallum Cancer Centre, St Andrew's Place, East Melbourne VIC 3002
Christobel Saunders School of Surgery and Pathology, QE11 Medical Centre, M block 2nd Floor, Nedlands WA 6907
Jodi Saunus Breast Pathology, University of Queensland Centre for Clinical Research, Building 71/918 Royal Brisbane and Women's Hospital, Herston Qld 4029
Robyn Sayer Gynaecological Cancer Centre, Royal Hospital for Women, Randwick NSW 2011
Elizabeth Scott South View Clinic, Suite 13, Level 3 South Street, Kogarah NSW 2217

Rodney Scott Hunter Area Pathology Service, John Hunter Hospital, Locked Bag 1 Regional Mail Centre, NSW 2310
Clare Scott Research Department, WEHI, C/o Royal Melbourne Hospital, Parkville, 3050
Ram Seshadri Department of Haematology, Flinders Medical Centre, Bedford Park SA 5042
Adrienne Sexton Familial Cancer Centre, Royal Melbourne Hospital, Grattan Street, Parkville Vic 3050
Raghwa Sharma Dept of Tissue Pathology, Westmead Hospital, Westmead NSW 2145
Andrew Shelling Obstetrics and Gynaecology, University of Auckland, New Zealand
Peter Simpson The University of Queensland, Building 71/918, RBWH Campus, Herston Qld 4029
Melissa Southey Genetic Epidemiology Laboratory, Departemnt of Pathology, University of Melbourne, VIC 3010
Amanda Spurdle Cancer Unit, Queensland Institute of Medical Research, Herston QLD 4029
Graeme Suthers South Australian Clinical Genetics Service, Centre for Medical Genetics, Women and Children's Hospital, North Adelaide SA 5006
Pamela Sykes Molecular Pathology, Flinders Medical Centre, Flinders Drive, Bedford Park, 5042, Australia
Donna Taylor Department of Radiology, Royal Perth Hospital, Perth WA
Jessica Taylor Familial Cancer and Genetics Medicine, Royal Melbourne Hospital, 2nd Floor Grattan Street, Parkville Vic 3050, Australia
Benjamin Thierry Ian Wark Research Institute, University of South Australia, Adelaide SA 5095 SA
Ella Thompson Cancer Genetics, Research Department, 3rd level, Peter MaCallum Cancer Centre, East Melbourne, Vic 3002
Heather Thorne Research Department, Peter MacCallum Cancer Centre, St Andrew's Place, East Melbourne VIC 3002
Sharron Townshend Genetic Services of Western Australia, 3rd Floor Agnes Walsh House, 374 Bagot Rd, Subiaco WA 6008
Alison Trainer University of NSW, Prince of Wales Hospital, Barker Street, Randwick NSW 2031
Lan Tran Medical Psychology Unit, University of Sydney, NSW 2006
Kathy Tucker Heredity Cancer Clinic, Prince of Wales Hospital, Randwick NSW 2031
Janet Tyler Hereditary Cancer Clinic, Prince of Wales Hospital, Randwick NSW 2031
Jane Visvader The Walter and Eliza Hall Institute of Medical Research, Post Office Royal Melbourne Hospital, Parkville VIC 3050
Logan Walker Molecular Cancer Epidemiology Laboratory, Queensland Institute of Medical Research, P.O. Royal Brisbane Hospital, Herston, Qld 4027, Australia
Ian Walpole Genetic Services of WA, King Edward Memorial Hospital, Subiaco WA 6008, Robin Ward Department of Medical Oncology, Prince of Wales Hospital, Randwick NSW 2031
Paul Waring Department of Pathology, University of WA, 35 Stirling Highway, CRAWLEY WA 6009 Perth,
Bev Warner Cabrini Hospital, 183 Wattletree Rd, Malvern VIC 3144.
Graham Warren St Vincent's Breast Clinic, PO Box 4751, Toowoomba QLD 4350
Rachael Williams Family Cancer Clinic, St Vincent's Hospital, Darlinghurst NSW 2010
Judy Wilson Block 4, Level 5, Royal North Shore Hospital, St Leonards NSW 2065
Ingrid Winship Department of Genetics, Royal Melbourne Hospital, Parkville, 3050
Kathy Wu Familial Cancer Centre, Westmead Hospital, Darcy Street, Westmead NSW 2045
Mary Ann Young Familial Cancer Clinic, Peter MacCallum Cancer Centre, St Andrew's Place, East Melbourne VIC 3002

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3. Author Contributions

Overall project management

JRBP, FD, CEE, PS, DJT, DFE, KS, JMM, KKO

Core analyses

JRBP, FD, CEE, PS, TF, DJT, DIC, TE, GT

Individual study analysts

AAR, AD, AG, AJ, AT, AVS, BZA, BF, CEE, DFG, DIC, DJT, DLC, DLK, EA, EKW, EM, EMB, ET, FD, GM, GmM, IMN, JAV, JD, JH, JRBP, JT, JZ, KLL, KM, LLP, LMR, LMY, LS, MM, NF, NTs, PK, PS, RM, SK, SS, SSU, TC, TE, TF, TFo, THP, WQA, ZK

Individual study data management and generation

AAR, ACH, AD, ADC, AGU, AJO, AMS, AMu, AP, APo, BAO, CAH, DC, DIC, DJH, DK, DLw, DPK, DPS, DS, EAN, EP, EW, FA, FBH, FG, FR, GD, GE, GGW, HS, HW, ID, JC, JH, JPR, LF, LFr, LM, LMR, MEG, MJS, MJW, MKB, MMb, MP, MW, NA, NJT, NLP, PKM, QW, RH, SB, SC, SG, SL, SR, SSU, TE, US, UT, VS, WLM

Individual study PIs

AC, AGU, AH, AJO, AKD, AL, AM, AMD, AMm, AMu, AR, BB, BZA, BHRW, CB, CEP, CG, CH, CMv, DIB, DF, DFE, DJH, DL, DLw, DSP, DPS, DSs, EAS, EB, EEJd, EI, EW, EWD, FBH, FJC, GC, GD, GGG, GW, GW, GWM, HA, HAB, HB, HBe, HF, HN, HS, HV, ID, ILA, JAK, JB, JCC, JGE, JEB, JLH, JMC, JMM, JP, KC, KK, KKO, KP, KS, LC, LF, LJB, MCS, MG, MIM, MJ, MJE, MJH, MJS, MKS, MWB, MZ, NGM, NJW, PAF, PD, PDPP, PFM, PG, PH, PK, PMR, PN, PP, PPG, PR, PV, RJFL, RLM, RW, SB, SBm, SC, SEB, TBH, TDS, TIAS, UH, VG, VK, VS

3. Website

After publication, the ReproGen Consortium website (www.reprogen.org) will host a publicly accessible version of the GWAS summary statistics, along with additional locus zoom plots of the regions highlighted in this manuscript.