Differences in polygenic score distributions in European ancestry populations: implications for breast cancer risk prediction

Supplementary Tables

Supplementary Table 1A: Studies participating in BCAC by country used in the analysis.

Study	Controls	Cases	Total	Acronym	Study design
				Australia	
ABCFS	738	1432	2170	Australian Breast Cancer Family Study	Case-control study
ABCTB	375	920	1295	Australian Breast Cancer Tissue Bank	Case-control study
BCEES	835	783	1618	Breast Cancer Employment and Environment Study	Case-control study
KCONFAB/AOCS	896	462	1358	Kathleen Cuningham Foundation Consortium for research into Familial Breast Cancer/Australian Ovarian Cancer Study	Case-control study
MCCS	1205	1065	2270	Melbourne Collaborative Cohort Study	Prospective cohort: nested case-control study
Total	**4049**	**4662**	**8711**		
				Belarus	
HMBCS	342	744	1086	Hannover-Minsk Breast Cancer Study	Case-control study
				Belgium	
LMBC	1823	3398	5221	Leuven Multidisciplinary Breast Centre	Case-control study
				Canada	
CBCS	817	568	1385	Canadian Breast Cancer Study	Case-control study
MTLGEBCS	464	533	997	Montreal Gene-Environment Breast Cancer Study	Case-control study
OFBCR	996	2209	3205	Ontario Familial Breast Cancer Registry	Case-control study
Total	**2277**	**3310**	**5587**		
				Denmark	
CGPS	5241	4275	9516	Copenhagen General Population Study	Case-control study
				Finland	
HEBCS	1236	1796	3032	Helsinki Breast Cancer Study	Case-control study
KBCP	433	543	976	Kuopio Breast Cancer Project	Case-control study
OBCS	414	499	913	Oulu Breast Cancer Study	Case-control study
Total	**2083**	**2838**	**4921**		
				France	
CECILE	1002	910	1912	CECILE Breast Cancer Study	Case-control study
EPIC	370	378	748	European Prospective Investigation Into Cancer and Nutrition	Prospective cohort: nested case-control study
Total	**1372**	**1288**	**2660**		
				Germany	
BBCC	706	839	1545	Bavarian Breast Cancer Cases and Controls	Case-control study

BSUCH	1119	991	2110	Breast Cancer Study of the University of Heidelberg	Case-control study
EPIC	650	586	1236	European Prospective Investigation Into Cancer and Nutrition	Prospective cohort: nested case-control study
ESTHER	505	475	980	ESTHER Breast Cancer Study	Case-control study
GC-HBOC	1732	3378	5110	German Consortium for Hereditary Breast & Ovarian Cancer	Case-control study
GENICA	710	912	1622	Gene Environment Interaction and Breast Cancer in Germany	Case-control study
GEPARSIXTO	0	387	387	Randomized phase II trial	Case-only study
GESBC	181	312	493	Genetic Epidemiology Study of Breast Cancer by Age 50	Case-control study
HABCS	866	909	1775	Hannover Breast Cancer Study	Case-control study
MARIE	2065	1642	3707	Mammary Carcinoma Risk Factor Investigation	Case-control study
PREFACE	0	2954	2954	Evaluation of Predictive Factors regarding the Effectivity of Aromatase Inhibitor Therapy	Case-only study
SKKDKFZS	29	1220	1249	Städtisches Klinikum Karlsruhe Deutsches Krebsforschungszentrum Study	Case-only study
SUCCESSB	0	440	440	Simultaneous Study of Gemcitabine-Docetaxel Combination adjuvant treatment	Case-only study
SUCCESSC	0	2836	2836	Simultaneous Study of Docetaxel Based Anthracycline Free Adjuvant Treatment Evaluation	Case-only study
Total	8563	17881	26444		
Greece					
CCGP	332	667	999	Crete Cancer Genetics Program	Case-control study
EPIC	180	173	353	European Prospective Investigation Into Cancer and Nutrition	Prospective cohort: nested case-control study
TNBCC	95	412	507	Triple-Negative Breast Cancer Consortium	Case-control studies
Total	607	1252	1859		
Ireland					
BIGGS	719	793	1512	Breast Cancer in Galway Genetic Study	Case-control study
Israel					
BCINIS	724	1337	2061	Breast Cancer in Northern Israel Study	Case-control study
Italy					
EPIC	788	743	1531	European Prospective Investigation Into Cancer and Nutrition	Prospective cohort: nested case-control study
MBCSG	766	738	1504	Milan Breast Cancer Study Group	Case-control study
Total	1554	1481	3035		
Netherlands					
ABCS	1817	1129	2946	Amsterdam Breast Cancer Study	Case-control study
EPIC	676	630	1306	European Prospective Investigation Into Cancer and Nutrition	Prospective cohort: nested case-control study
ORIGO	986	1239	2225	Leiden University Medical Centre Breast Cancer Study	Prospective cohort: nested case-control study
RBCS	928	1029	1957	Rotterdam Breast Cancer Study	Case-control study
ABCS-F	0	989	989	Amsterdam Breast Cancer Study – Familial	Case-only study
Total	4407	5016	9423		
Norway					
NBCS	217	2386	2603	Norwegian Breast Cancer Study	Case-control study
Poland					

PBCS	2082	1767	3849	NCI Polish Breast Cancer Study	Case-control study
SZBCS	472	683	1155	IHCC-Szczecin Breast Cancer Study	Case-control study
Total	**2554**	**2450**	**5004**		
				Republic of North Macedonia	
MABCS	92	78	170	Macedonian Breast Cancer Study	Case-control study
				Russia	
HUBCS	120	211	331	Hannover-Ufa Breast Cancer Study	Case-control study
				Spain	
BREOGAN	916	1536	2452	Breast Oncology Galicia Network	Case-control study
CNIO-BCS	871	866	1737	Spanish National Cancer Centre Breast Cancer Study	Case-control study
EPIC	311	299	610	European Prospective Investigation Into Cancer and Nutrition	Prospective cohort: nested case-control study
HCSC	0	423	423	Hospital Clinico San Carlos	Case-control study
Total	**2098**	**3124**	**5222**		
				Sweden	
KARBAC	658	806	1464	Karolinska Breast Cancer Study	Case-control study
KARMA	6983	2839	9822	Karolinska Mammography Project for Risk Prediction of Breast Cancer – Cohort Study	Case-control study
MISS	1545	633	2178	Melanoma Inquiry of Southern Sweden	Prospective cohort: nested case-control study
PKARMA	5417	5041	10458	Karolinska Mammography Project for Risk Prediction of Breast Cancer - Case-Control Study	Case-control study
SASBAC	1373	1129	2502	Singapore and Sweden Breast Cancer Study	Case-control study
SMC	704	1509	2213	Swedish Mammography Cohort	Prospective cohort: nested case-control study
Total	**16680**	**11957**	**28637**		
				UK	
BBCS	1838	1525	3363	British Breast Cancer Study	Case-control study
DIETCOMPLYF	0	708	708	DietCompLyf Breast Cancer Survival Study	Prospective cohort: nested case-control study
EPIC	669	626	1295	European Prospective Investigation Into Cancer and Nutrition	Prospective cohort: nested case-control study
FHRISK	943	146	1089	Family History Risk Study	Case-control study
GLACIER	0	1918	1918	Study to Investigate the Genetics of Lobular Carcinoma In situ in Europe	
ICICLE	1	204	205	Study to Investigate the Genetics of In Situ Carcinoma of the Ductal Subtype	
POSH	0	1088	1088	Prospective Study of Outcomes in Sporadic Versus Hereditary Breast Cancer	Case-only study
PROCAS	1648	380	2028	Predicting the Risk Of Cancer At Screening Study	Prospective cohort: nested case-control study
SBCS	848	878	1726	Sheffield Breast Cancer Study	Case-control study
SEARCH	8901	12805	21706	Study of Epidemiology and Risk factors in Cancer Heredity	Case-control study
UKBGS	1032	1053	2085	UK Breakthrough Generations Study	Prospective cohort: nested case-control study
UKOPS	974	0	974	UK Ovarian Cancer Population Study	Case-control study
Total	**16854**	**21331**	**38185**		
				USA	
2SISTER	0	919	919	The Two Sister Study	Case-only study
AHS	1137	513	1650	Agricultural Health Study	Prospective cohorts: nested case-control studies
BCFR-NY	27	384	411	New York site of the Breast Cancer Family Registry	Case-control study

BCFR-PA	0	67	67	Philadelphia site of the Breast Cancer Family Registry	Case-control study
BCFR-UTAH	0	100	100	Utah site of the Breast Cancer Family Registry	Case-control study
CPSII	3315	2525	5840	Cancer Prevention Study-II Nutrition Cohort	Prospective cohort: nested case-control study
CTS	647	1176	1823	California Teachers Study	Prospective cohort: nested case-control study
MCBCS	2050	2071	4121	Mayo Clinic Breast Cancer Study	Case-control study
MEC	852	773	1625	Multiethnic Cohort	Prospective cohort: nested case-control study
MMHS	1635	275	1910	Mayo Mammography Health Study	Prospective cohort: nested case-control study
MSKCC	0	136	136	Memorial Sloan-Kettering Cancer Center Study	Case-control study
NBHS	731	572	1303	Nashville Breast Health Study	Case-control study
NC-BCFR	151	759	910	Northern California Breast Cancer Family Registry	Case-control study
NCBCS	1006	2074	3080	North Carolina Breast Cancer study	Case-control study
NHS	1804	1103	2907	Nurses Health Study	Prospective cohort: nested case-control study
NHS2	1905	1112	3017	Nurses Health Study 2	Prospective cohort: nested case-control study
PLCO	2595	1822	4417	The Prostate, Lung, Colorectal and Ovarian (PLCO) Cancer Screening Trial	Prospective cohort: nested case-control study
SISTER	1556	1504	3060	The Sister Study	Prospective cohort: nested case-control study
TNBCC	328	176	504	Triple-Negative Breast Cancer Consortium	Case-control studies
UBCS	0	606	606	Utah Breast Cancer Study	
UCIBCS	258	427	685	UCI Breast Cancer Study	Case-control study
USRT	1699	1354	3053	US Radiologic Technologists Study	Case-control study
Total	21696	20448	42144		
Total	**94072**	110260	204332		

Supplementary Table 1B: Total number of white female individuals participating in the UK Biobank stratified by country of birth, used in the analysis.

Country	Controls used to calculate PRS$_{306}$	Controls used to calculate standard PRS
Australia	507	507
Austria	118	118
Canada	434	434
Cyprus	131	131
Denmark	152	152
Finland	130	130
France	539	538
Germany	1283	1281
Ireland	2462	2459
Italy	347	347
Malta	165	165
Netherlands	308	308
New Zealand	369	368
Poland	406	406
Portugal	180	180
Russia	118	118
Spain	201	201
Sweden	141	141
Switzerland	121	121
UK, England	184385	184106
UK, Northern Ireland	1454	1453
UK, Scotland	19658	19628
UK, Wales	10679	10668
USA	817	816
Total	225105	224776

Supplementary Table 2: The 313 variants included in the PRS$_{313}$ as calculated by Mavaddat et al., 2019 AJHG (1). Seven variants (indicated with an asterisk) of PRS$_{313}$ were not available in the UK Biobank.

SNP name	Chromosome	Position b37[1]	Reference/Effect Allele	Effect size for Overall PRS[2]	Effect size for ER-positive PRS[3]	Effect size for ER-negative PRS[4]
1_7917076_G_A	1	7917076	G/A	-0.0409	-0.0393	-0.0566
1_10566215_A_G	1	10566215	A/G	-0.0586	-0.0407	-0.1109
1_18807339_T_C	1	18807339	T/C	-0.0564	-0.0649	-0.0248
1_41380440_C_T	1	41380440	C/T	0.0426	0.0423	0.0395
1_41389220_T_C	1	41389220	T/C	0.1550	0.1377	0.1483
1_46670206_TC_T	1	46670206	TC/T	0.0447	0.0595	0.0216
1_51467096_CT_C	1	51467096	CT/C	0.0374	0.0426	0.0038
1_88156923_G_A	1	88156923	G/A	0.0494	0.058	0.0183
1_88428199_C_A	1	88428199	C/A	-0.0387	-0.0385	-0.047
1_100880328_A_T	1	100880328	A/T	0.0373	0.0355	0.016
1_110198129_CAAA_C	1	110198129	CAAA/C	0.0458	0.0545	0.0266
1_114445880_G_A	1	114445880	G/A	0.0621	0.0642	0.0579
1_118141492_A_C	1	118141492	A/C	0.0452	0.0417	0.0551
1_120257110_T_C	1	120257110	T/C	0.0385	0.043	0.0226
1_121280613_A_G	1	121280613	A/G	0.0881	0.1052	0.0209
1_121287994_A_G	1	121287994	A/G	-0.0673	-0.0814	-0.0114
1_145604302_C_CT	1	145604302	C/CT	-0.0399	-0.0469	-0.0126
1_149906413_T_C	1	149906413	T/C	0.0548	0.0625	0.0388
1_155556971_G_A	1	155556971	G/A	0.0499	0.0606	0.0263
1_168171052_CA_C	1	168171052	CA/C	-0.0680	-0.0774	-0.0718
1_172328767_T_TA	1	172328767	T/TA	-0.0435	-0.0417	-0.0655
1_201437832_C_T	1	201437832	C/T	0.0917	0.0815	0.0714
1_202184600_C_T	1	202184600	C/T	-0.0065	0.0133	-0.0822
1_203770448_T_A	1	203770448	T/A	0.0498	0.0472	0.0332
1_204502514_T_TTCTGAAACAGGG	1	204502514	T/TTCTGAAACAGGG	-0.0321	-0.0024	-0.1345
1_208076291_G_A	1	208076291	G/A	-0.0366	-0.0313	-0.0278
1_217053815_T_G	1	217053815	T/G	0.0417	0.0409	0.0472
1_217220574_G_A	1	217220574	G/A	-0.0440	-0.0459	0.0029
1_220671050_C_T	1	220671050	C/T	0.0418	0.0482	0.0153
1_242034263_A_G	1	242034263	A/G	0.1428	0.1519	0.1413
2_10138983_T_C	2	10138983	T/C	0.0603	0.0596	0.0458
2_19315675_T_A	2	19315675	T/A	-0.0331	-0.0229	-0.057
2_25129473_A_G	2	25129473	A/G	-0.0427	-0.0365	-0.067
2_29179452_G_C	2	29179452	G/C	-0.0066	0.0207	-0.1006
2_29615233_T_C	2	29615233	T/C	-0.0427	-0.0489	-0.0371
2_39699510_C_CT	2	39699510	C/CT	-0.0402	-0.0336	-0.0538
2_70172587_G_A	2	70172587	G/A	-0.0412	-0.0334	-0.0361
2_88358825_G_C	2	88358825	G/C	0.0473	0.0443	0.0505
2_121058254_A_G	2	121058254	A/G	-0.0334	-0.0232	-0.0682
2_121089731_T_C	2	121089731	T/C	-0.0427	-0.029	-0.1027
2_121159205_G_A	2	121159205	G/A	-0.0440	-0.0507	-0.0162
2_121246568_T_C	2	121246568	T/C	0.0992	0.092	0.1112
2_172974566_C_G	2	172974566	C/G	-0.0473	-0.0611	-0.0061
2_174212910_A_G	2	174212910	A/G	0.0593	0.0621	0.0175
2_192381934_C_T	2	192381934	C/T	0.0316	0.018	0.1012
2_202204741_T_C	2	202204741	T/C	-0.0492	-0.0505	-0.0526
2_217920769_G_T	2	217920769	G/T	-0.1318	-0.1532	-0.0589
2_217955896_GA_G	2	217955896	GA/G	-0.2016	-0.2362	-0.0558
2_218292158_C_G	2	218292158	C/G	-0.0757	-0.0813	-0.0599
2_218714845_G_A	2	218714845	G/A	-0.0431	-0.0463	-0.0184
2_241388857_C_A	2	241388857	C/A	-0.1232	-0.1335	-0.1727
3_4742251_A_G	3	4742251	A/G	0.0616	0.0609	0.0422
3_27353716_C_A	3	27353716	C/A	0.0748	0.0822	0.031
3_27388664_C_G	3	27388664	C/G	0.0502	0.0539	0.0297
3_29294845_C_T	3	29294845	C/T	-0.1281	-0.1221	-0.2988
3_30684907_C_T	3	30684907	C/T	0.0592	0.0657	0.017
3_46888198_T_C	3	46888198	T/C	-0.0806	-0.0842	-0.0716
3_49709912_C_CT	3	49709912	C/CT	-0.0367	-0.0355	-0.0721
3_55970777_A_AT	3	55970777	A/AT	-0.1195	-0.124	-0.0586
3_59373745_C_T	3	59373745	C/T	-0.0394	-0.0439	-0.0398
3_63887449_T_TTG*	3	63887449	T/TTG	0.0648	0.0627	0.043
3_71620370_T_G	3	71620370	T/G	-0.0374	-0.0345	-0.0379
3_87037543_A_G	3	87037543	A/G	-0.0723	-0.0726	-0.0531
3_99403877_G_A	3	99403877	G/A	-0.0376	-0.0378	-0.0279
3_141112859_CTT_C	3	141112859	CTT/C	0.0551	0.0607	0.0282
3_172285237_G_A	3	172285237	G/A	0.0422	0.0501	-0.0133
3_189774456_C_T	3	189774456	C/T	-0.0478	-0.0469	-0.0449

4_38784633_G_T	4	38784633	G/T	0.0489	0.0495	0.0497
4_84370124_TAA_TA*	4	84370124	TAA/TA	-0.0464	-0.0438	-0.0489
4_89240476_G_A	4	89240476	G/A	0.0352	0.0392	0.0261
4_92594859_TTCTTTC_T	4	92594859	TTCTTTC/T	-0.0407	-0.0377	-0.0359
4_106069013_G_T	4	106069013	G/T	0.0471	0.0594	0.0097
4_126752992_A_AAT*	4	126752992	A/AAT	-0.0377	-0.0361	-0.0638
4_143467195_C_T	4	143467195	C/T	-0.0569	-0.0613	-0.0594
4_151218296_CATATTT_C	4	151218296	CATATTT/C	0.0388	0.0307	0.0557
4_175842495_G_A	4	175842495	G/A	-0.0898	-0.1162	0.0199
4_175847436_C_A	4	175847436	C/A	0.0348	0.0537	-0.0099
4_187503758_A_T*	4	187503758	A/T	0.0357	0.0352	0.0194
5_345109_T_C	5	345109	T/C	0.0840	0.0856	0.0681
5_1279790_C_T	5	1279790	C/T	0.0617	0.0325	0.1502
5_1296255_A_AG	5	1296255	A/AG	-0.0549	-0.0417	-0.1056
5_1353077_T_C	5	1353077	T/C	0.1552	0.1572	0.1214
5_2777029_G_A	5	2777029	G/A	0.0391	0.041	0.0231
5_16231194_G_C	5	16231194	G/C	-0.0426	-0.0458	-0.0404
5_32579616_TCA_T	5	32579616	TCA/T	0.0363	0.0394	0.0072
5_44508264_G_GT	5	44508264	G/GT	-0.1177	-0.126	-0.1053
5_44619502_A_G	5	44619502	A/G	-0.1101	-0.1186	-0.0959
5_44649944_C_T	5	44649944	C/T	0.0492	0.0713	-0.0261
5_44706498_A_G	5	44706498	A/G	0.0497	0.0648	-0.0256
5_44853593_G_C	5	44853593	G/C	-0.0336	-0.0222	-0.0778
5_52679539_C_CA*	5	52679539	C/CA	0.0571	0.0663	0.042
5_55662540_C_CT	5	55662540	C/CT	-0.0458	-0.045	-0.0299
5_55965167_C_T	5	55965167	C/T	0.0394	0.0379	0.0405
5_56023083_T_G	5	56023083	T/G	0.1366	0.1612	0.0686
5_56042972_C_T	5	56042972	C/T	0.0865	0.1082	0.0058
5_56045081_T_C	5	56045081	T/C	-0.0564	-0.0643	-0.0168
5_58241712_C_T	5	58241712	C/T	-0.0434	-0.0369	-0.0408
5_71965007_G_A	5	71965007	G/A	-0.0410	-0.0445	-0.0238
5_73234583_T_C	5	73234583	T/C	-0.0363	-0.0494	-0.0101
5_77155397_GT_G	5	77155397	GT/G	-0.0408	-0.0418	-0.0489
5_79180995_G_GA	5	79180995	G/GA	0.0328	0.0248	0.0804
5_81512947_TA_T	5	81512947	TA/T	-0.0598	-0.0731	-0.0342
5_90789470_G_A	5	90789470	G/A	-0.0564	-0.0714	-0.0031
5_104300273_G_T	5	104300273	G/T	-0.0487	-0.0524	-0.0271
5_122478676_C_A	5	122478676	C/A	-0.0386	-0.0376	-0.04
5_122705244_C_T	5	122705244	C/T	0.0944	0.0963	0.0607
5_131640536_A_G	5	131640536	A/G	0.0392	0.0467	0.0099
5_132407058_C_T	5	132407058	C/T	-0.0388	-0.0561	-0.0214
5_158244083_C_T	5	158244083	C/T	-0.0677	-0.0635	-0.0646
5_169591460_T_C	5	169591460	T/C	0.0412	0.0501	0.0182
5_173358154_G_A	5	173358154	G/A	0.0365	0.0395	0.0346
5_176134882_T_C	5	176134882	T/C	0.0363	0.0368	0.0262
6_13713366_G_C	6	13713366	G/C	-0.0553	-0.0623	-0.0152
6_16399557_C_T	6	16399557	C/T	-0.0373	-0.0435	-0.0324
6_18783140_G_A	6	18783140	G/A	0.0326	0.0478	0.0033
6_20537845_CA_C	6	20537845	CA/C	-0.0391	-0.0416	-0.0315
6_21923810_T_C	6	21923810	T/C	-0.0321	-0.0438	-0.0032
6_27425644_G_C	6	27425644	G/C	-0.0737	-0.0838	-0.0506
6_43227141_G_A	6	43227141	G/A	-0.0640	-0.0614	-0.0673
6_82263549_AAT_A	6	82263549	AAT/A	0.0477	0.0406	0.0686
6_85912194_CAA_C	6	85912194	CAA/C	0.0762	0.0569	0.0682
6_87803819_T_C	6	87803819	T/C	0.0383	0.0318	0.0678
6_130341728_C_CT	6	130341728	C/CT	0.0472	0.0433	0.0804
6_149595505_T_C	6	149595505	T/C	-0.0476	-0.0601	-0.0235
6_151949806_A_C	6	151949806	A/C	0.0703	0.0541	0.1103
6_151955914_A_G	6	151955914	A/G	0.1449	0.115	0.224
6_152022664_CAAAAAAA_C	6	152022664	CAAAAAAA/C	0.0137	0.0185	-0.017
6_152023191_G_A	6	152023191	G/A	0.0626	0.0509	0.1008
6_152055978_A_T	6	152055978	A/T	0.0740	0.0634	0.108
6_152432902_C_T	6	152432902	C/T	0.0649	0.0527	0.0965
6_169006947_C_G	6	169006947	C/G	-0.0308	-0.0252	-0.0628
6_170332621_T_C	6	170332621	T/C	0.0373	0.0403	0.0334
7_21940960_A_G	7	21940960	A/G	-0.0467	-0.0413	-0.0574
7_25569548_C_T	7	25569548	C/T	-0.0486	-0.0485	-0.0682
7_28869017_G_A	7	28869017	G/A	-0.0572	-0.0504	-0.0487
7_55192256_A_C	7	55192256	A/C	-0.0349	-0.0269	-0.0536
7_91459189_A_ATT*	7	91459189	A/ATT	0.0452	0.0439	0.0486
7_94113799_T_C	7	94113799	T/C	0.0449	0.0489	0.0116

7_98005235_G_A	7	98005235	G/A	-0.0467	-0.0466	-0.0267
7_99948655_T_G	7	99948655	T/G	0.0420	0.0385	0.0497
7_101552440_G_A	7	101552440	G/A	-0.0568	-0.0742	-0.0241
7_102481842_T_C	7	102481842	T/C	0.0418	0.0406	0.0411
7_130656911_C_T	7	130656911	C/T	-0.0476	-0.0522	-0.025
7_130674481_G_A	7	130674481	G/A	0.0416	0.0407	0.028
7_139943702_CT_C	7	139943702	CT/C	0.0582	0.0666	0.0057
7_144048902_G_T	7	144048902	G/T	-0.0563	-0.0592	-0.0148
8_170692_T_C	8	170692	T/C	0.0477	0.0348	0.104
8_17787610_CT_C	8	17787610	CT/C	-0.0377	-0.0367	-0.0295
8_23447496_A_G	8	23447496	A/G	-0.0389	-0.0361	-0.0426
8_23663653_C_A	8	23663653	C/A	0.0335	0.0451	0.0059
8_29509616_A_C	8	29509616	A/C	-0.0601	-0.0655	-0.0512
8_36858483_A_G	8	36858483	A/G	-0.0760	-0.0713	-0.1013
8_76230943_A_G	8	76230943	A/G	0.0755	0.0817	0.0617
8_76333056_C_T	8	76333056	C/T	0.1129	0.1216	0.0879
8_76378165_G_T	8	76378165	G/T	-0.0391	-0.0418	-0.026
8_102483100_T_C	8	102483100	T/C	0.0593	0.0736	0.0137
8_106358620_A_T	8	106358620	A/T	-0.0745	-0.0895	-0.01
8_117209548_A_G	8	117209548	A/G	-0.0417	-0.0456	-0.0409
8_120862186_A_G	8	120862186	A/G	0.0527	0.0598	0.0472
8_124563705_T_C	8	124563705	T/C	0.0477	0.0465	0.0503
8_124571581_G_A	8	124571581	G/A	0.0340	0.0355	0.0388
8_124739913_T_G	8	124739913	T/G	0.0466	0.0395	0.0706
8_128213561_C_CA	8	128213561	C/CA	-0.0430	-0.0468	-0.04
8_128370949_C_G	8	128370949	C/G	0.0642	0.082	0.0076
8_128372172_A_G	8	128372172	A/G	0.0597	0.0508	0.057
8_129199566_G_A	8	129199566	G/A	0.0615	0.0643	0.0505
8_143669254_A_G	8	143669254	A/G	-0.0346	-0.0518	-0.022
9_6880263_A_G	9	6880263	A/G	0.0348	0.0499	-0.0078
9_21964882_CAAAA_C	9	21964882	CAAAA/C	0.0550	0.0467	0.0576
9_22041998_C_G	9	22041998	C/G	0.0289	0.0168	0.0906
9_36928288_T_C	9	36928288	T/C	0.0249	0.0259	0.0631
9_87782211_T_C	9	87782211	T/C	0.0361	0.0432	0.0218
9_98362587_T_C	9	98362587	T/C	0.0576	0.0625	0.0828
9_110303808_TAA_T	9	110303808	TAA/T	0.0797	0.1007	0.013
9_110837073_A_G	9	110837073	A/G	0.1158	0.1315	0.0289
9_110837176_C_T	9	110837176	C/T	0.0653	0.0809	-0.0037
9_110849525_G_T	9	110849525	G/T	0.0153	0.0111	0.0336
9_110885479_C_T	9	110885479	C/T	0.0877	0.111	0.0019
9_119313486_A_G	9	119313486	A/G	-0.0462	-0.0477	-0.0403
9_129424719_A_G	9	129424719	A/G	-0.0382	-0.0437	-0.0287
9_136146597_C_T	9	136146597	C/T	0.0400	0.04	0.0253
10_5794652_A_G	10	5794652	A/G	0.0470	0.0504	0.0385
10_13892298_G_A	10	13892298	G/A	0.0371	0.0362	0.0382
10_22032942_A_G	10	22032942	A/G	-0.0580	-0.0719	0.0344
10_22477776_ACC_A	10	22477776	ACC/A	0.1687	0.1668	0.1849
10_22861490_A_C	10	22861490	A/C	0.0875	0.096	0.0201
10_38523626_C_A	10	38523626	C/A	0.0404	0.0381	0.0418
10_64299890_A_G	10	64299890	A/G	-0.1345	-0.1428	-0.103
10_64819996_G_T	10	64819996	G/T	0.0472	0.0442	0.0403
10_71335574_C_T	10	71335574	C/T	-0.0404	-0.0411	-0.054
10_80851257_G_T	10	80851257	G/T	-0.0805	-0.0898	-0.0443
10_80886726_A_G	10	80886726	A/G	0.0762	0.078	0.0444
10_95292187_CAA_C	10	95292187	CAA/C	-0.0512	-0.049	-0.0419
10_114777670_C_T	10	114777670	C/T	0.0472	0.0422	0.0559
10_115128491_T_C	10	115128491	T/C	-0.0592	-0.0602	-0.0592
10_123095209_G_A	10	123095209	G/A	-0.0538	-0.0702	0.0048
10_123340107_A_G	10	123340107	A/G	0.1508	0.1837	0.0053
10_123340431_GC_G	10	123340431	GC/G	-0.2408	-0.2913	-0.0326
10_123349324_A_T	10	123349324	A/T	-0.2609	-0.327	-0.0137
11_433617_T_C	11	433617	T/C	-0.0437	-0.0494	-0.0322
11_803017_A_G	11	803017	A/G	0.0457	0.04	0.0559
11_1895708_C_A	11	1895708	C/A	-0.0762	-0.0788	-0.0538
11_18664241_T_G	11	18664241	T/G	0.0461	0.0455	0.0633
11_42844441_C_T	11	42844441	C/T	-0.0336	-0.0334	-0.0669
11_44368892_G_A	11	44368892	G/A	0.0374	0.0357	0.021
11_46318032_C_G	11	46318032	C/G	-0.0748	-0.0693	-0.0688
11_65553492_C_A	11	65553492	C/A	0.0425	0.0444	0.0305
11_65572431_G_A	11	65572431	G/A	-0.0347	-0.0448	-0.0067
11_69328130_A_T	11	69328130	A/T	-0.0423	-0.0538	0.0143

11_69330983_G_A	11	69330983	G/A	0.1022	0.124	0.0174
11_69331418_C_T	11	69331418	C/T	0.1782	0.2018	0.0066
11_103614438_T_G	11	103614438	T/G	0.0147	0.0029	0.0676
11_108267402_C_CA	11	108267402	C/CA	-0.0022	0.0141	-0.0629
11_111696440_T_C	11	111696440	T/C	-0.0396	-0.0435	-0.0122
11_116727936_A_T	11	116727936	A/T	-0.0423	-0.0372	-0.062
11_122966626_A_G	11	122966626	A/G	-0.0383	-0.0372	-0.0484
11_129243417_T_G	11	129243417	T/G	-0.0543	-0.0477	-0.0605
11_129461016_A_G	11	129461016	A/G	0.0453	0.0401	0.0594
12_293626_A_G	12	293626	A/G	0.0401	0.0371	0.039
12_14413931_G_C	12	14413931	G/C	0.0484	0.0411	0.054
12_28149568_C_T	12	28149568	C/T	-0.0620	-0.0501	-0.0683
12_28174817_C_T	12	28174817	C/T	-0.0856	-0.083	-0.101
12_28347382_C_T	12	28347382	C/T	-0.0521	-0.0454	-0.0469
12_29140260_G_A	12	29140260	G/A	0.0647	0.069	0.0753
12_57146069_T_G	12	57146069	T/G	-0.0579	-0.0585	-0.0632
12_70798355_A_T	12	70798355	A/T	0.0469	0.0471	0.015
12_83064195_G_GA	12	83064195	G/GA	0.0671	0.0645	0.0717
12_85004551_C_T	12	85004551	C/T	0.0348	0.0355	0.0358
12_96027759_A_G	12	96027759	A/G	-0.0867	-0.0842	-0.063
12_103097887_C_T	12	103097887	C/T	0.0546	0.0611	0.0149
12_111600134_G_T	12	111600134	G/T	-0.0442	-0.0441	-0.0537
12_115108136_T_C	12	115108136	T/C	0.0465	0.0533	0.0188
12_115796577_A_G	12	115796577	A/G	-0.0428	-0.0643	-0.0148
12_115835836_T_C	12	115835836	T/C	-0.0813	-0.0977	-0.0153
12_120832146_C_T	12	120832146	C/T	0.0516	0.0534	0.0529
13_32839990_G_A	13	32839990	G/A	0.0424	0.0386	0.0759
13_32972626_A_T	13	32972626	A/T	0.2687	0.2308	0.4284
13_43501356_A_G	13	43501356	A/G	0.0517	0.0458	0.0975
13_73806982_T_C	13	73806982	T/C	0.0345	0.0251	0.0653
13_73960952_A_G	13	73960952	A/G	0.0399	0.0368	0.073
14_37128564_C_A	14	37128564	C/A	-0.0733	-0.085	-0.0339
14_37228504_C_T	14	37228504	C/T	0.0390	0.0408	0.0256
14_68660428_T_C	14	68660428	T/C	-0.0474	-0.0612	0.0245
14_68979835_T_C	14	68979835	T/C	-0.0911	-0.0972	-0.0762
14_91751788_TC_T	14	91751788	TC/T	0.0380	0.0447	0.0091
14_91841069_A_G	14	91841069	A/G	0.0513	0.0553	0.0312
14_93070286_C_T	14	93070286	C/T	-0.0577	-0.0519	-0.0592
14_105213978_T_G	14	105213978	T/G	0.0399	0.035	0.0403
15_46680811_C_A	15	46680811	C/A	-0.1973	-0.1823	-0.2337
15_50694306_A_G	15	50694306	A/G	-0.0417	-0.0403	-0.0392
15_66630569_G_A	15	66630569	G/A	-0.0369	-0.0377	-0.0343
15_67457698_A_G	15	67457698	A/G	0.0782	0.099	0.0141
15_75750383_T_C	15	75750383	T/C	-0.0413	-0.0419	-0.0419
15_91512267_G_T	15	91512267	G/T	-0.0589	-0.0557	-0.0487
15_100905819_A_C	15	100905819	A/C	-0.0608	-0.0599	-0.0746
16_4008542_CAAAAA_C	16	4008542	CAAAAA/C	-0.0329	-0.0184	-0.0892
16_4106788_C_A	16	4106788	C/A	-0.0300	-0.0182	-0.0782
16_6963972_C_G	16	6963972	C/G	0.0354	0.0303	0.0811
16_10706580_G_A	16	10706580	G/A	-0.0740	-0.0763	-0.0491
16_23007047_G_T	16	23007047	G/T	0.1218	0.1363	0.0927
16_52538825_C_A	16	52538825	C/A	0.1147	0.1153	0.0917
16_52599188_C_T	16	52599188	C/T	0.1070	0.1202	0.0431
16_53809123_C_T	16	53809123	C/T	-0.0704	-0.0651	-0.0957
16_53861139_C_T	16	53861139	C/T	-0.0338	-0.0167	-0.0782
16_53861592_G_A	16	53861592	G/A	-0.0337	-0.0342	-0.0303
16_54682064_G_A	16	54682064	G/A	0.0477	0.0554	0.0304
16_80648296_A_G	16	80648296	A/G	0.0839	0.089	0.0467
16_85145977_T_C	16	85145977	T/C	-0.0211	-0.0044	-0.0714
16_87086492_T_C	16	87086492	T/C	-0.0469	-0.0454	-0.0374
17_29168077_G_T	17	29168077	G/T	-0.0568	-0.0637	-0.0604
17_39251123_T_C	17	39251123	T/C	0.0799	0.0631	0.1431
17_40127060_T_C	17	40127060	T/C	0.0174	-0.0161	0.1511
17_40485239_G_T	17	40485239	G/T	-0.0571	-0.0416	-0.1142
17_40744470_G_A	17	40744470	G/A	0.2017	0.1917	0.1108
17_43212339_C_CT	17	43212339	C/CT	0.0438	0.0352	0.0478
17_44283858_G_A	17	44283858	G/A	-0.0540	-0.0532	-0.0384
17_53209774_A_C	17	53209774	A/C	-0.0793	-0.0933	-0.0365
17_77781725_A_G	17	77781725	A/G	-0.0401	-0.0378	-0.0501
18_11696613_C_T	18	11696613	C/T	-0.0381	-0.0281	-0.094
18_20634253_C_T	18	20634253	C/T	-0.0415	-0.0486	-0.0284

18_24125857_T_C	18	24125857	T/C	0.0346	0.035	0.0231
18_24337424_C_G	18	24337424	C/G	0.0455	0.0483	0.0282
18_24518050_AT_A	18	24518050	AT/A	-0.0599	-0.083	0.006
18_25407513_C_G	18	25407513	C/G	0.0399	0.0307	0.0648
18_29981526_G_A	18	29981526	G/A	-0.1058	-0.0962	-0.152
18_42411803_G_C	18	42411803	G/C	-0.0877	-0.1037	-0.0189
18_42888797_T_C	18	42888797	T/C	-0.0542	-0.0589	-0.0372
19_13249921_G_T	19	13249921	G/T	0.0956	0.0924	0.069
19_17393925_C_A	19	17393925	C/A	0.0378	0.0036	0.1692
19_18569492_C_T	19	18569492	C/T	-0.0719	-0.0778	-0.0629
19_19517054_C_CGGGCG	19	19517054	C/CGGGCG	0.0437	0.0442	0.0577
19_44283031_T_C	19	44283031	T/C	0.0619	0.0605	0.067
19_46166073_T_C	19	46166073	T/C	-0.0360	-0.0447	-0.0117
19_55816678_C_T	19	55816678	C/T	-0.0359	-0.0381	-0.0346
20_5948227_G_A	20	5948227	G/A	0.0760	0.0762	0.0694
20_11379842_T_C	20	11379842	T/C	0.0844	0.0998	0.0752
20_41613706_C_G	20	41613706	C/G	0.0315	0.0266	0.0784
20_52296849_G_A	20	52296849	G/A	0.0440	0.0539	0.0144
21_16364756_T_G	21	16364756	T/G	0.0646	0.0742	0.0322
21_16566350_A_G	21	16566350	A/G	0.0595	0.0678	0.0172
21_16574455_C_A	21	16574455	C/A	-0.0707	-0.0808	-0.0329
21_47762932_G_A	21	47762932	G/A	0.0946	0.0852	0.089
22_19766137_C_T	22	19766137	C/T	-0.0367	-0.0426	-0.022
22_29121087_A_G	22	29121087	A/G	0.1839	0.2812	-0.1566
22_29135543_G_A	22	29135543	G/A	0.0654	0.0659	0.0536
22_29203724_C_T	22	29203724	C/T	0.1405	0.1793	0.0191
22_29551872_A_G	22	29551872	A/G	-0.1716	-0.1671	-0.1318
22_38583315_AAAAG_AAAAGAAAG*	22	38583315	AAAAG/AAAAGAAAG	-0.0471	-0.0608	0.0079
22_39343916_T_A	22	39343916	T/A	0.0407	0.0326	0.033
22_40904707_CT_C	22	40904707	CT/C	0.1148	0.116	0.1203
22_43433100_C_T	22	43433100	C/T	-0.0600	-0.0585	-0.0515
22_45319953_G_A	22	45319953	G/A	-0.0134	-0.006	-0.0611
22_46283297_G_A	22	46283297	G/A	0.0736	0.0719	0.0993

*These 7 variants were not available in the UK Biobank

[1]Position build 37

[2]Effect size of the effect allele for overall breast cancer risk, as calcualted by Mavaddat et al., 2019 AJHG

[3]Effect size of the effect allele for ER-positive breast cancer risk, as calcualted by Mavaddat et al., 2019 AJHG

[4]Effect size of the effect allele for ER-negative breast cancer risk, as calcualted by Mavaddat et al., 2019 AJHG

Supplementary Table 3A: Mean and SE of the standardized PRS$_{313}$[1] across the countries for overall breast cancer in controls of BCAC dataset, and when adjusted for the first 6 and 10 principal components (PCs).

Country	Controls	Controls Onco	Controls iCOGS	Cases	Total	Studies	Mean (SE) PRS$_{313}$ adjusted for array[2]	Standard Deviation[3] of the adjusted mean PRS$_{313}$	Mean of raw PRS$_{313}$ adjusted for array	SE of raw PRS$_{313}$ adjusted for array	Standard Deviation[3] of the adjusted raw mean PRS$_{313}$	Mean of raw PRS$_{313}$ (not adjusted for array)	Standard Deviation of the raw mean PRS$_{313}$ (not adjusted for array)	Mean (SE) PRS$_{313}$ adjusted for 6 PCs and array	Mean (SE) PRS$_{313}$ adjusted for 10 PCs and array	Mean PRS$_{313}$ Fitted values adjusted for 6 PCs (PRS ~ 6 PCs)[4]
Australia	4049	2375	1674	4662	8711	ABCFS, ABCTB, BCEES, MCCS, KCONFAB/AOCS	-0.005(0.016)	1.02	-0.45	0.01	0.636	-0.456	0.615	0.01(0.017)	0.01(0.017)	-0.005
Belarus	342	249	93	744	1086	HMBCS	0.07(0.054)	1.00	-0.404	0.033	0.610	-0.408	0.679	0.071(0.057)	0.058(0.057)	0.016
Belgium	1823	1268	555	3398	5221	LMBC	-0.006(0.024)	1.02	-0.45	0.014	0.598	-0.455	0.599	-0.007(0.024)	0.002(0.024)	0.010
Canada	2277	1630	647	3310	5587	CBCS, MTLGEBCS, OFBCR	0.018(0.021)	1.00	-0.435	0.013	0.620	-0.44	0.633	0.019(0.021)	0.018(0.021)	0.013
Denmark	5241	716	4525	4275	9516	CGPS	-0.013(0.015)	1.09	-0.455	0.009	0.652	-0.468	0.602	0.012(0.017)	0.013(0.017)	-0.031
Finland	2083	422	1661	2838	4921	HEBCS, KBCP, OBCS	0.031(0.023)	1.05	-0.428	0.014	0.639	-0.44	0.605	0.008(0.044)	0.042(0.044)	0.010
France	1372	529	843	1288	2660	CECILE, EPIC	0.0003(0.027)	1.00	-0.447	0.017	0.630	-0.456	0.611	-0.008(0.029)	-0.003(0.029)	0.008
Germany	8563	4471	4092	17881	26444	BBCC, BSUCH, EPIC, ESTHER, GC-HBOC, GENICA, GEPARSIXTO, GESBC, HABCS, MARIE, PREFACE, SKKDKFZS, SUCCESSB, SUCCESSC	0.011(0.011)	1.02	-0.44	0.007	0.648	-0.447	0.608	0.004(0.013)	0.008(0.013)	0.013
Greece	607	512	95	1252	1859	CCGP, EPIC, TNBCC	0.232(0.041)	1.01	-0.305	0.025	0.616	-0.307	0.593	0.043(0.046)	0.043(0.047)	0.208
Ireland	719	0	719	793	1512	BIGGS	-0.118(0.038)	1.02	-0.519	0.023	0.617	-0.534	0.620	-0.015(0.045)	-0.021(0.047)	-0.112
Israel	724	724	0	1337	2061	BCINIS	0.047(0.037)	1.00	-0.418	0.023	0.619	-0.418	0.651	0.001(0.048)	0.002(0.048)	0.062
Italy	1554	1154	400	1481	3035	EPIC, MBCSG	0.115(0.025)	0.99	-0.376	0.016	0.631	-0.38	0.606	-0.007(0.03)	0.007(0.03)	0.131
Netherlands	4407	1765	2642	5016	9423	ABCS, EPIC, ORIGO, RBCS, ABCS-F	0.021(0.016)	1.06	-0.434	0.01	0.664	-0.442	0.615	0.043(0.018)	0.049(0.018)	-0.019
Norway	217	0	217	2386	2603	NBCS	0.077(0.068)	1.00	-0.399	0.042	0.619	-0.414	0.568	0.094(0.069)	0.085(0.07)	-0.027
Poland	2554	2219	335	2450	5004	PBCS, SZBCS	0.013(0.02)	1.01	-0.439	0.012	0.606	-0.441	0.621	0.025(0.028)	0.022(0.028)	0.010
Republic of North Macedonia	92	92	0	78	170	MABCS	0.25(0.104)	1.00	-0.294	0.064	0.614	-0.294	0.587	0.134(0.105)	0.138(0.106)	0.140
Russia	120	120	0	211	331	HUBCS	0.18(0.091)	1.00	-0.337	0.056	0.613	-0.337	0.688	0.166(0.093)	0.1(0.094)	0.044
Spain	2098	1227	871	3124	5222	BREOGAN, EPIC, HCSC, CNIO-BCS	0.057(0.022)	1.01	-0.412	0.013	0.595	-0.418	0.603	-0.006(0.029)	-0.005(0.033)	0.057
Sweden	16680	9280	7400	11957	28637	KARBAC, KARMA, MISS, PKARMA, SMC, SASBAC	-0.015(0.008)	1.03	-0.456	0.005	0.646	-0.462	0.615	0.005(0.014)	-0.009(0.015)	-0.017
UK	16854	8054	8800	21331	38185	BBCS, DIETCOMPLYF, EPIC, FHRISK, POSH, PROCAS, SBCS, SEARCH, UKBGS, UKOPS, GLACIER, ICICLE	-0.01(0.009)	1.17	-0.453	0.005	0.649	-0.46	0.611	0.019(0.01)	0.022(0.01)	-0.023
USA	21696	19008	2688	20448	42144	2SISTER, AHS, BCFR-NY, BCFR-PA, BCFR-UTAH, CPSII, CTS, MCBCS, MEC, MMHS, MSKCC, NBHS, NC-BCFR, NCBCS, NHS, NHS2, PLCO, SISTER, TNBCC, UBCS, UCIBCS, USRT	0.029(0.007)	1.03	-0.429	0.004	0.589	-0.431	0.610	0.033(0.007)	0.033(0.007)	0.013
Total	94072	55815	38257	110260	204332											

[1]PRS was standardized based on the controls of the pooled dataset

[2]Mean PRS$_{313}$ was adjusted for array, and results were fitted without an intercept

[3]Standard deviation was calculated using the SE of the adjusted mean PRS using the formula SD=SE*SQRT(Number_Controls)

[4]Mean PRS$_{313}$ by country using predicted PRS, estimated using linear predictor of PRS vs 6 PCs and the command predict() in R.

Supplementary Table 3B: Mean and SE of the standardized PRS$_{313}$[1] across the countries for ER-specific breast cancer in controls of BCAC dataset, and when adjusted for the first 6 or 10 principal components (PCs).

Country	Controls	Controls Onco	Controls iCOGS	Cases	Total	Studies	ER-positive		ER-negative	
							Mean (SE) PRS$_{313}$ adjusted for array[2]	Mean (SE) PRS$_{313}$ adjusted for 6 PCs and array	Mean (SE) PRS$_{313}$ adjusted for array[2]	Mean (SE) PRS$_{313}$ adjusted for 10 PCs and array
Australia	4049	2375	1674	4662	8711	ABCFS, ABCTB, BCEES, MCCS, KCONFAB/AOCS	0.001(0.016)	0.015(0.017)	-0.029(0.016)	-0.016(0.017)
Belarus	342	249	93	744	1086	HMBCS	0.062(0.054)	0.06(0.057)	0.116(0.054)	0.104(0.057)
Belgium	1823	1268	555	3398	5221	LMBC	0.001(0.024)	-0.001(0.024)	-0.033(0.024)	-0.016(0.024)
Canada	2277	1630	647	3310	5587	CBCS, MTLGEBCS, OFBCR	0.02(0.021)	0.019(0.021)	0.003(0.021)	0.011(0.021)
Denmark	5241	716	4525	4275	9516	CGPS	-0.021(0.015)	0.008(0.017)	0.027(0.015)	0.022(0.018)
Finland	2083	422	1661	2838	4921	HEBCS, KBCP, OBCS	0.031(0.023)	0.022(0.044)	0.021(0.023)	-0.019(0.044)
France	1372	529	843	1288	2660	CECILE, EPIC	0.008(0.027)	-0.005(0.029)	-0.045(0.027)	-0.026(0.029)
Germany	8563	4471	4092	17881	26444	BBCC, BSUCH, EPIC, ESTHER, GC-HBOC, GENICA, GEPARSIXTO, GESBC, HABCS, MARIE, PREFACE, SKKDKFZS, SUCCESSB, SUCCESSC	0.017(0.011)	0.008(0.013)	-0.02(0.011)	-0.012(0.013)
Greece	607	512	95	1252	1859	CCGP, EPIC, TNBCC	0.257(0.041)	0.057(0.046)	0.029(0.041)	-0.017(0.047)
Ireland	719	0	719	793	1512	BIGGS	-0.122(0.038)	-0.018(0.045)	-0.086(0.038)	-0.019(0.047)
Israel	724	724	0	1337	2061	BCINIS	0.049(0.037)	0.003(0.048)	-0.05(0.037)	-0.01(0.048)
Italy	1554	1154	400	1481	3035	EPIC, MBCSG	0.136(0.025)	0.002(0.03)	-0.029(0.025)	-0.03(0.03)
Netherlands	4407	1765	2642	5016	9423	ABCS, EPIC, ORIGO, RBCS, ABCS-F	0.02(0.016)	0.043(0.017)	0.036(0.016)	0.051(0.018)
Norway	217	0	217	2386	2603	NBCS	0.059(0.068)	0.083(0.069)	0.118(0.068)	0.077(0.07)
Poland	2554	2219	335	2450	5004	PBCS, SZBCS	0.017(0.02)	0.026(0.028)	0.002(0.02)	0.007(0.028)
Republic of North Macedonia	92	92	0	78	170	MABCS	0.257(0.104)	0.134(0.105)	0.168(0.104)	0.145(0.106)
Russia	120	120	0	211	331	HUBCS	0.159(0.091)	0.147(0.093)	0.232(0.091)	0.147(0.094)
Spain	2098	1227	871	3124	5222	BREOGAN, EPIC, HCSC, CNIO-BCS	0.065(0.022)	-0.008(0.029)	0.006(0.022)	0.002(0.033)
Sweden	16680	9280	7400	11957	28637	KARBAC, KARMA, MISS, PKARMA, SMC, SASBAC	-0.019(0.008)	0.007(0.014)	0.001(0.008)	-0.044(0.015)
UK	16854	8054	8800	21331	38185	BBCS, DIETCOMPLYF, EPIC, FHRISK, POSH, PROCAS, SBCS, SEARCH, UKBGS, UKOPS, GLACIER, ICICLE	-0.011(0.009)	0.018(0.01)	0.006(0.009)	0.025(0.01)
USA	21696	19008	2688	20448	42144	2SISTER, AHS, BCFR-NY, BCFR-PA, BCFR-UTAH, CPSII, CTS, MCBCS, MEC, MMHS, MSKCC, NBHS, NC-BCFR, NCBCS, NHS, NHS2, PLCO, SISTER, TNBCC, UBCS, UCIBCS, USRT	0.029(0.007)	0.033(0.007)	0.025(0.007)	0.028(0.007)

[1]PRS was standardized based on the controls of the pooled dataset

[2]Mean PRS_{313} was adjusted for array, and results were fitted without an intercept

Supplementary Table 4: Mean and SE of the standardized PRS_{306}[1] and when adjusted for the first 8 or 10 principal components (PCs), and of the standard PRS (as defined by the UK Biobank) across the countries for overall breast cancer, in white females participating in the UK Biobank.

Country	Mean (SE) PRS_{306}	Mean (SE) PRS_{306} adjusted for 8 PCs	Mean (SE) PRS_{306} adjusted for 10 PCs	Mean (SE) standard PRS
Australia	0.009 (0.044)	0.051 (0.045)	0.05 (0.045)	0.042 (0.044)
Austria	-0.048 (0.092)	-0.048 (0.093)	-0.046 (0.093)	-0.046 (0.092)
Canada	0.057 (0.048)	0.097 (0.049)	0.096 (0.049)	0.021 (0.048)
Cyprus	0.274 (0.087)	0.195 (0.089)	0.187 (0.089)	0.404 (0.087)
Denmark	0.159 (0.081)	0.199 (0.082)	0.195 (0.082)	0.056 (0.081)
Finland	0.026 (0.088)	0.014 (0.092)	0.012 (0.092)	-0.192 (0.088)
France	-0.008 (0.043)	-0.007 (0.045)	0 (0.045)	0.053 (0.043)
Germany	0.03 (0.028)	0.052 (0.03)	0.053 (0.03)	-0.06 (0.028)
Ireland	-0.041 (0.02)	0.036 (0.023)	0.031 (0.023)	0.024 (0.02)
Italy	0.191 (0.054)	0.098 (0.058)	0.098 (0.058)	0.364 (0.054)
Malta	0.193 (0.078)	0.158 (0.079)	0.157 (0.079)	0.319 (0.078)
Netherlands	0.007 (0.057)	0.044 (0.058)	0.041 (0.058)	-0.095 (0.057)
New Zealand	-0.02 (0.052)	0.029 (0.053)	0.027 (0.053)	0.071 (0.052)
Poland	0.124 (0.05)	0.108 (0.057)	0.117 (0.057)	-0.133 (0.05)
Portugal	0.184 (0.075)	0.105 (0.076)	0.117 (0.077)	0.265 (0.075)
Russia	0.267 (0.092)	0.224 (0.096)	0.228 (0.096)	-0.082 (0.092)
Spain	0.095 (0.071)	0.045 (0.072)	0.059 (0.074)	0.106 (0.071)
Sweden	-0.008 (0.084)	0.027 (0.085)	0.022 (0.085)	-0.26 (0.084)
Switzerland	0.013 (0.091)	0.012 (0.092)	0.013 (0.092)	0.127 (0.091)
UK, England	0 (0.002)	0.047 (0.009)	0.046 (0.009)	-0.007 (0.002)
UK, Northern Ireland	0.015 (0.026)	0.081 (0.028)	0.074 (0.028)	0.034 (0.026)
UK, Scotland	-0.002 (0.007)	0.059 (0.012)	0.052 (0.012)	0.031 (0.007)
UK, Wales	-0.022 (0.01)	0.028 (0.013)	0.052 (0.014)	0.027 (0.01)
USA	-0.013 (0.035)	0.013 (0.036)	0.013 (0.036)	0.06 (0.035)

[1]PRS was standardized based on the controls

Supplementary Table 5: Mean frequency and standard deviation of each variant in the PRS_{313} across the countries and coefficient of variation.

SNP name	Mean Frequency	Standard Deviation	Coefficient of variation
22_29121087_A_G	0.009	0.015	1.662
13_32839990_G_A	0.017	0.012	0.692
5_122705244_C_T	0.036	0.021	0.586
5_1353077_T_C	0.008	0.005	0.536
6_27425644_G_C	0.067	0.032	0.473
22_29135543_G_A	0.090	0.037	0.410
10_22477776_ACC_A	0.019	0.008	0.403
3_29294845_C_T	0.013	0.005	0.389
18_29981526_G_A	0.047	0.018	0.380
3_55970777_A_AT	0.026	0.010	0.370
19_13249921_G_T	0.041	0.014	0.345
21_47762932_G_A	0.036	0.012	0.343
4_38784633_G_T	0.260	0.088	0.339
17_40744470_G_A	0.011	0.004	0.331
1_121287994_A_G	0.113	0.036	0.319
15_46680811_C_A	0.011	0.004	0.313
1_201437832_C_T	0.055	0.017	0.311
22_29203724_C_T	0.022	0.006	0.296
5_345109_T_C	0.051	0.014	0.280
20_5948227_G_A	0.065	0.018	0.276
6_152055978_A_T	0.063	0.017	0.274
1_242034263_A_G	0.030	0.008	0.272
5_56042972_C_T	0.050	0.013	0.267
8_36858483_A_G	0.199	0.053	0.265
1_41389220_T_C	0.015	0.004	0.261
17_44283858_G_A	0.177	0.046	0.258
21_16566350_A_G	0.086	0.022	0.258
10_123349324_A_T	0.054	0.014	0.253
13_32972626_A_T	0.008	0.002	0.251
5_44508264_G_GT	0.136	0.034	0.247
16_23007047_G_T	0.025	0.006	0.236
7_98005235_G_A	0.159	0.037	0.235
10_123340107_A_G	0.072	0.017	0.232
15_67457698_A_G	0.046	0.011	0.229
6_151955914_A_G	0.075	0.017	0.228
3_63887449_T_TTG	0.120	0.027	0.225
9_98362587_T_C	0.094	0.021	0.218
3_87037543_A_G	0.087	0.019	0.216
8_76333056_C_T	0.091	0.019	0.212
11_69331418_C_T	0.072	0.015	0.212
9_110837073_A_G	0.066	0.014	0.210
8_129199566_G_A	0.184	0.038	0.208
6_43227141_G_A	0.097	0.020	0.207
12_28149568_C_T	0.111	0.022	0.200
22_40904707_CT_C	0.113	0.023	0.200

22_39343916_T_A	0.251	0.049	0.197
2_217955896_GA_G	0.038	0.007	0.193
8_102483100_T_C	0.096	0.018	0.189
1_168171052_CA_C	0.112	0.021	0.187
7_28869017_G_A	0.108	0.020	0.187
2_70172587_G_A	0.277	0.052	0.187
3_46888198_T_C	0.102	0.019	0.187
11_46318032_C_G	0.063	0.012	0.185
17_40127060_T_C	0.054	0.010	0.183
5_79180995_G_GA	0.171	0.031	0.180
3_4742251_A_G	0.359	0.065	0.180
22_43433100_C_T	0.109	0.020	0.179
15_75750383_T_C	0.271	0.048	0.179
22_46283297_G_A	0.114	0.020	0.178
16_53861592_G_A	0.366	0.065	0.178
17_43212339_C_CT	0.233	0.041	0.176
4_143467195_C_T	0.110	0.019	0.174
11_116727936_A_T	0.203	0.035	0.173
2_10138983_T_C	0.112	0.019	0.173
12_120832146_C_T	0.163	0.027	0.168
5_52679539_C_CA	0.103	0.017	0.166
12_115796577_A_G	0.198	0.033	0.166
17_40485239_G_T	0.082	0.014	0.165
12_103097887_C_T	0.117	0.019	0.165
5_44619502_A_G	0.151	0.025	0.163
3_27388664_C_G	0.280	0.045	0.160
2_29179452_G_C	0.230	0.035	0.150
4_106069013_G_T	0.238	0.035	0.149
22_19766137_C_T	0.396	0.058	0.147
18_42411803_G_C	0.074	0.011	0.146
8_120862186_A_G	0.136	0.020	0.145
4_175842495_G_A	0.113	0.016	0.145
3_49709912_C_CT	0.297	0.043	0.144
6_85912194_CAA_C	0.058	0.008	0.144
14_68979835_T_C	0.250	0.036	0.144
7_101552440_G_A	0.114	0.016	0.143
3_141112859_CTT_C	0.389	0.055	0.140
11_108267402_C_CA	0.434	0.060	0.138
10_64299890_A_G	0.166	0.023	0.138
9_110303808_TAA_T	0.216	0.030	0.137
15_100905819_A_C	0.110	0.015	0.136
1_155556971_G_A	0.224	0.030	0.136
18_11696613_C_T	0.145	0.020	0.136
20_52296849_G_A	0.241	0.032	0.135
1_88156923_G_A	0.146	0.020	0.134
5_132407058_C_T	0.232	0.031	0.134
10_5794652_A_G	0.208	0.027	0.132
17_39251123_T_C	0.064	0.008	0.132
2_121089731_T_C	0.194	0.026	0.132
3_172285237_G_A	0.213	0.028	0.131

9_136146597_C_T	0.269	0.035	0.131
3_30684907_C_T	0.306	0.039	0.129
10_123095209_G_A	0.340	0.044	0.129
1_46670206_TC_T	0.285	0.037	0.128
9_6880263_A_G	0.288	0.037	0.127
1_220671050_C_T	0.241	0.030	0.126
12_83064195_G_GA	0.101	0.013	0.124
12_57146069_T_G	0.104	0.013	0.122
7_91459189_A_ATT	0.333	0.041	0.122
1_118141492_A_C	0.269	0.033	0.122
6_149595505_T_C	0.208	0.025	0.121
5_173358154_G_A	0.403	0.048	0.119
15_50694306_A_G	0.352	0.042	0.119
7_21940960_A_G	0.348	0.041	0.119
5_81512947_TA_T	0.247	0.029	0.119
1_114445880_G_A	0.166	0.020	0.117
1_51467096_CT_C	0.481	0.056	0.117
11_69330983_G_A	0.122	0.014	0.116
12_14413931_G_C	0.261	0.030	0.116
7_25569548_C_T	0.168	0.019	0.116
12_111600134_G_T	0.375	0.043	0.116
5_56045081_T_C	0.166	0.019	0.115
6_151949806_A_C	0.306	0.035	0.114
5_71965007_G_A	0.248	0.028	0.114
12_70798355_A_T	0.177	0.020	0.114
8_106358620_A_T	0.101	0.012	0.114
2_29615233_T_C	0.274	0.031	0.114
10_80886726_A_G	0.166	0.019	0.113
13_73806982_T_C	0.304	0.034	0.112
1_203770448_T_A	0.267	0.030	0.111
5_55662540_C_CT	0.366	0.040	0.110
16_80648296_A_G	0.237	0.026	0.110
11_69328130_A_T	0.214	0.023	0.110
1_7917076_G_A	0.381	0.042	0.109
1_88428199_C_A	0.247	0.027	0.109
1_217220574_G_A	0.209	0.022	0.106
16_87086492_T_C	0.256	0.027	0.105
11_803017_A_G	0.509	0.053	0.105
10_64819996_G_T	0.198	0.021	0.104
6_152432902_C_T	0.520	0.054	0.104
11_65553492_C_A	0.179	0.019	0.104
11_42844441_C_T	0.322	0.033	0.104
16_10706580_G_A	0.069	0.007	0.104
5_104300273_G_T	0.182	0.019	0.103
15_91512267_G_T	0.139	0.014	0.103
19_18569492_C_T	0.341	0.035	0.102
2_218714845_G_A	0.373	0.038	0.102
3_189774456_C_T	0.216	0.022	0.102
12_115108136_T_C	0.267	0.027	0.102
5_77155397_GT_G	0.349	0.035	0.101

5_90789470_G_A	0.164	0.016	0.101
5_169591460_T_C	0.342	0.034	0.100
7_94113799_T_C	0.273	0.027	0.100
6_16399557_C_T	0.339	0.034	0.099
9_110837176_C_T	0.164	0.016	0.097
14_93070286_C_T	0.170	0.016	0.096
6_169006947_C_G	0.533	0.051	0.095
5_1296255_A_AG	0.301	0.029	0.095
12_28347382_C_T	0.206	0.019	0.094
9_22041998_C_G	0.140	0.013	0.093
4_175847436_C_A	0.336	0.031	0.093
5_44706498_A_G	0.247	0.023	0.093
7_144048902_G_T	0.227	0.021	0.092
1_149906413_T_C	0.396	0.036	0.091
1_208076291_G_A	0.326	0.030	0.091
22_45319953_G_A	0.418	0.038	0.091
2_121159205_G_A	0.338	0.031	0.091
8_23663653_C_A	0.394	0.035	0.090
7_55192256_A_C	0.536	0.048	0.089
8_124563705_T_C	0.150	0.013	0.088
2_172974566_C_G	0.462	0.040	0.087
8_170692_T_C	0.220	0.019	0.087
12_28174817_C_T	0.239	0.021	0.086
17_29168077_G_T	0.267	0.023	0.085
1_10566215_A_G	0.321	0.027	0.085
16_53809123_C_T	0.429	0.036	0.084
9_21964882_CAAAA_C	0.314	0.026	0.083
16_52538825_C_A	0.263	0.022	0.083
5_1279790_C_T	0.266	0.022	0.083
17_53209774_A_C	0.294	0.024	0.083
7_130656911_C_T	0.362	0.030	0.083
16_52599188_C_T	0.249	0.020	0.082
10_71335574_C_T	0.301	0.025	0.082
5_131640536_A_G	0.535	0.043	0.080
12_85004551_C_T	0.507	0.041	0.080
19_17393925_C_A	0.289	0.023	0.079
1_172328767_T_TA	0.324	0.025	0.079
5_56023083_T_G	0.153	0.012	0.078
7_99948655_T_G	0.216	0.017	0.078
6_21923810_T_C	0.429	0.033	0.077
19_19517054_C_CGGGCG	0.361	0.028	0.076
8_76378165_G_T	0.363	0.027	0.076
10_38523626_C_A	0.361	0.027	0.075
1_145604302_C_CT	0.344	0.026	0.075
21_16364756_T_G	0.167	0.012	0.074
6_152023191_G_A	0.393	0.029	0.073
21_16574455_C_A	0.320	0.023	0.072
18_24518050_AT_A	0.280	0.020	0.072
2_19315675_T_A	0.547	0.039	0.071
1_100880328_A_T	0.407	0.029	0.071

5_44853593_G_C	0.303	0.021	0.070
15_66630569_G_A	0.626	0.043	0.069
1_202184600_C_T	0.397	0.027	0.069
1_121280613_A_G	0.407	0.028	0.069
5_32579616_TCA_T	0.475	0.033	0.069
14_37128564_C_A	0.210	0.014	0.068
22_38583315_AAAAG_AAAAGAAAG	0.286	0.019	0.068
8_128370949_C_G	0.410	0.028	0.068
7_130674481_G_A	0.299	0.020	0.068
2_121058254_A_G	0.707	0.048	0.067
9_119313486_A_G	0.397	0.027	0.067
19_55816678_C_T	0.356	0.023	0.064
19_44283031_T_C	0.345	0.022	0.064
4_89240476_G_A	0.446	0.029	0.064
6_87803819_T_C	0.271	0.017	0.064
7_139943702_CT_C	0.529	0.034	0.063
11_1895708_C_A	0.398	0.025	0.063
16_4106788_C_A	0.240	0.015	0.062
8_128213561_C_CA	0.409	0.025	0.062
11_65572431_G_A	0.497	0.030	0.061
10_22032942_A_G	0.702	0.043	0.061
10_114777670_C_T	0.462	0.028	0.060
2_25129473_A_G	0.403	0.024	0.060
8_128372172_A_G	0.561	0.033	0.060
12_115835836_T_C	0.414	0.025	0.059
5_73234583_T_C	0.327	0.019	0.059
6_82263549_AAT_A	0.438	0.026	0.059
3_71620370_T_G	0.632	0.036	0.057
12_96027759_A_G	0.296	0.017	0.057
1_204502514_T_TTCTGAAACAGGG	0.806	0.046	0.057
11_44368892_G_A	0.548	0.031	0.057
18_24337424_C_G	0.616	0.035	0.057
5_16231194_G_C	0.560	0.032	0.057
3_99403877_G_A	0.483	0.027	0.057
9_110885479_C_T	0.637	0.036	0.057
11_129461016_A_G	0.608	0.034	0.056
2_88358825_G_C	0.318	0.018	0.056
1_217053815_T_G	0.323	0.018	0.056
3_59373745_C_T	0.422	0.024	0.056
5_158244083_C_T	0.574	0.032	0.056
12_293626_A_G	0.389	0.021	0.055
16_85145977_T_C	0.478	0.026	0.055
14_68660428_T_C	0.821	0.045	0.054
4_84370124_TAA_TA	0.533	0.029	0.054
10_13892298_G_A	0.438	0.024	0.054
9_87782211_T_C	0.516	0.028	0.054
7_102481842_T_C	0.345	0.018	0.053
18_24125857_T_C	0.419	0.022	0.053
10_80851257_G_T	0.625	0.033	0.053
14_105213978_T_G	0.467	0.025	0.053

8_23447496_A_G	0.656	0.035	0.053
5_176134882_T_C	0.534	0.028	0.052
14_37228504_C_T	0.424	0.022	0.052
10_123340431_GC_G	0.596	0.031	0.052
9_36928288_T_C	0.536	0.028	0.052
4_187503758_A_T	0.446	0.023	0.052
4_126752992_A_AAT	0.519	0.026	0.051
17_77781725_A_G	0.501	0.025	0.050
2_217920769_G_T	0.491	0.024	0.050
9_129424719_A_G	0.454	0.023	0.050
6_20537845_CA_C	0.467	0.023	0.049
4_92594859_TTCTTTC_T	0.445	0.022	0.049
6_18783140_G_A	0.617	0.030	0.048
13_73960952_A_G	0.761	0.036	0.048
11_18664241_T_G	0.710	0.034	0.047
18_42888797_T_C	0.346	0.016	0.047
11_103614438_T_G	0.657	0.031	0.047
5_58241712_C_T	0.580	0.027	0.046
8_124571581_G_A	0.420	0.019	0.046
11_122966626_A_G	0.287	0.013	0.045
14_91751788_TC_T	0.698	0.031	0.044
8_117209548_A_G	0.639	0.028	0.044
1_120257110_T_C	0.531	0.023	0.044
8_124739913_T_G	0.400	0.018	0.044
4_151218296_CATATTT_C	0.655	0.029	0.044
8_17787610_CT_C	0.611	0.027	0.044
5_2777029_G_A	0.412	0.018	0.044
18_20634253_C_T	0.640	0.027	0.042
9_110849525_G_T	0.613	0.025	0.042
6_170332621_T_C	0.605	0.025	0.041
16_6963972_C_G	0.777	0.032	0.041
5_44649944_C_T	0.600	0.024	0.041
3_27353716_C_A	0.531	0.021	0.040
2_202204741_T_C	0.708	0.028	0.040
14_91841069_A_G	0.340	0.014	0.040
8_143669254_A_G	0.355	0.014	0.039
19_46166073_T_C	0.620	0.023	0.038
11_433617_T_C	0.817	0.030	0.036
11_111696440_T_C	0.628	0.022	0.035
1_41380440_C_T	0.651	0.022	0.034
16_53861139_C_T	0.757	0.025	0.033
5_122478676_C_A	0.740	0.024	0.033
8_29509616_A_C	0.671	0.022	0.033
6_13713366_G_C	0.567	0.018	0.033
5_55965167_C_T	0.565	0.018	0.032
20_41613706_C_G	0.805	0.025	0.031
16_54682064_G_A	0.488	0.015	0.031
1_18807339_T_C	0.523	0.016	0.031
8_76230943_A_G	0.830	0.024	0.029
6_130341728_C_CT	0.724	0.020	0.028

10_115128491_T_C	0.777	0.021	0.027
10_95292187_CAA_C	0.829	0.022	0.026
16_4008542_CAAAAA_C	0.822	0.021	0.026
2_174212910_A_G	0.852	0.022	0.026
18_25407513_C_G	0.703	0.018	0.025
6_152022664_CAAAAAAA_C	0.610	0.014	0.024
2_218292158_C_G	0.728	0.017	0.023
2_39699510_C_CT	0.474	0.011	0.022
2_121246568_T_C	0.893	0.019	0.022
13_43501356_A_G	0.827	0.018	0.022
11_129243417_T_G	0.860	0.018	0.021
10_22861490_A_C	0.935	0.019	0.020
1_110198129_CAAA_C	0.780	0.015	0.020
2_192381934_C_T	0.864	0.016	0.019
20_11379842_T_C	0.950	0.017	0.018
12_29140260_G_A	0.913	0.011	0.012
22_29551872_A_G	0.986	0.006	0.006
2_241388857_C_A	0.978	0.006	0.006

Supplementary Table 6: Mean standardized PRS$_{313}$ by country in controls of the pooled BCAC dataset, estimated using an Empirical Bayes approach, and when adjusted for the first 6 principal components (PCs) and array.

Country	Posterior Mean (no PCs)[1]	Posterior Mean adjusted for 6 PCs[2]	95% CI Posterior Mean adjusted for 6 PCs[3]	Mean PRS adjusted for 6 PCs[4]
Australia	-0.003	0.012	-0.017, 0.041	0.010
Belarus	0.064	0.048	-0.022, 0.119	0.071
Belgium	-0.002	0.000	-0.041, 0.041	-0.007
Canada	0.020	0.020	-0.017, 0.058	0.019
Denmark	-0.012	0.014	-0.012, 0.04	0.012
Finland	0.032	0.012	-0.027, 0.051	0.008
France	0.004	0.001	-0.045, 0.047	-0.008
Germany	0.011	0.005	-0.016, 0.025	0.004
Greece	0.199	0.038	-0.023, 0.099	0.043
Ireland	-0.092	0.002	-0.056, 0.06	-0.015
Israel	0.047	0.012	-0.046, 0.07	0.001
Italy	0.110	0.001	-0.043, 0.045	-0.007
Netherlands	0.022	0.042	0.014, 0.07	0.043
Norway	0.066	0.052	-0.025, 0.129	0.094
Poland	0.015	0.026	-0.01, 0.062	0.025
Republic of North Macedonia	0.129	0.049	-0.037, 0.135	0.134
Russia	0.110	0.060	-0.023, 0.144	0.166
Spain	0.056	0.001	-0.038, 0.039	-0.006
Sweden	-0.014	0.005	-0.01, 0.02	0.005
UK	-0.010	0.019	0.004, 0.034	0.019
USA	0.029	0.033	0.02, 0.046	0.033

[1]Country-specific estimates, means β, using the Empirical Bayes approach, adjusted for array

[2]Country-specific estimates, means β, using the Empirical Bayes approach, adjusted for 6 PCs and array

[3]95% Confidence Interval of posterior mean PRS$_{313}$ adjusted for 6 PCs and array

[4]Mean PRS$_{313}$ adjusted for 6 PCs and array (Supplementary Table 3A)

Supplementary Table 7A: Total number and percentage of controls and cases of the BCAC dataset, in each percentile of the standardized PRS$_{313}$ distribution (standardized by the controls). Associations between overall breast cancer risk and PRS$_{313}$ by percentiles.

Percentiles	Controls	Percentage	Cases	Percentage	OR (95% CI)	Cutoffs (using the controls)
<1%	941	1	193	0.2	0.21 (0.18-0.24)	[-2.3053558, -2.3053558]
1-5%	3763	4	1245	1.1	0.33 (0.31-0.36)	[-2.3053558, -1.6315827]
5-10%	4704	5	1969	1.8	0.42 (0.40-0.45)	[-1.6315827, -1.2814921]
10-20%	9407	10	4945	4.5	0.53 (0.51-0.55)	[-1.2814921, -0.8417227]
20-40%	18814	20	13524	12.3	0.73 (0.70-0.75)	[-0.8417227, -0.2585700]
40-60%	18814	20	18651	16.9	REF[1]	[-0.2585700, 0.2491237]
60-80%	18814	20	25355	23	1.36 (1.32-1.40)	[0.2491237, 0.8401592]
80-90%	9407	10	17069	15.5	1.83 (1.77-1.89)	[0.8401592, 1.2827931]
90-95%	4704	5	11153	10.1	2.39 (2.30-2.49)	[**1.2827931**, 1.6581001]
95-99%	3763	4	11438	10.4	3.06 (2.93-3.19)	[**1.6581001**, 2.3365986]
≥99%	941	1	4718	4.3	5.06 (4.70-5.44)	[**2.3365986**, 5.0236339]

[1] The 40-60% was used as the reference percentile

Supplementary Table 7B: Total number and percentage of controls and cases by country of the BCAC dataset, included in the 90th percentile of the distribution when using pooled dataset (Individuals with standardized PRS$_{313}$ ≥ 1.283)

Country	Controls	Percentage	Cases	Percentage	Percentage of the diefference	Country	Controls	Cases
Australia	439	10.842	1122	24.067	-0.842	Australia	4049	4662
Belarus	52	**15.205**	137	18.414	**-5.205**	Belarus	342	744
Belgium	175	9.600	770	22.660	0.400	Belgium	1823	3398
Canada	249	10.935	877	26.495	-0.935	Canada	2277	3310
Denmark	487	9.292	1009	23.602	0.708	Denmark	5241	4275
Finland	230	11.042	732	25.793	-1.042	Finland	2083	2838
France	117	**8.528**	315	24.457	**1.472**	France	1372	1288
Germany	819	9.564	4549	25.440	0.436	Germany	8563	17881
Greece	83	**13.674**	345	27.556	**-3.674**	Greece	607	1252
Ireland	60	**8.345**	157	19.798	**1.655**	Ireland	719	793
Israel	97	**13.398**	348	26.028	**-3.398**	Israel	724	1337
Italy	183	11.776	457	30.858	**-1.776**	Italy	1554	1481
Netherlands	475	10.778	1394	27.791	-0.778	Netherlands	4407	5016
Norway	22	10.138	589	24.686	-0.138	Norway	217	2386
Poland	266	10.415	622	25.388	-0.415	Poland	2554	2450
Republic of North Macedonia	15	**16.304**	31	39.744	**-6.304**	Republic of North Macedonia	92	78
Russia	16	**13.333**	56	26.540	**-3.333**	Russia	120	211
Spain	213	10.153	839	26.857	-0.153	Spain	2098	3124
Sweden	1603	9.610	2997	25.065	0.390	Sweden	16680	11957
UK	1580	9.375	5206	24.406	0.625	UK	16854	21331
USA	2227	10.265	4757	23.264	-0.265	USA	21696	20448

Supplementary Table 7C: Total number and percentage of controls and cases by country of the BCAC dataset, included in the 95th percentile of the distribution when using pooled dataset (Individuals with standardized PRS$_{313}$ ≥ 1.658)

Country	Controls	Percentage	Cases	Percentage	Percentage of the diefference	Country	Controls	Cases
Australia	198	4.890	687	14.736	0.110	Australia	4049	4662
Belarus	31	9.064	83	11.156	-4.064	Belarus	342	744
Belgium	96	5.266	471	13.861	-0.266	Belgium	1823	3398
Canada	125	5.490	540	16.314	-0.490	Canada	2277	3310
Denmark	243	4.637	580	13.567	0.363	Denmark	5241	4275

Country	Controls	Percentage	Cases	Percentage	Percentage of the diefference	Country	Controls	Cases
Finland	114	5.473	421	14.834	-0.473	Finland	2083	2838
France	53	3.863	188	14.596	1.137	France	1372	1288
Germany	416	4.858	2686	15.022	0.142	Germany	8563	17881
Greece	38	6.260	219	17.492	-1.260	Greece	607	1252
Ireland	26	3.616	86	10.845	1.384	Ireland	719	793
Israel	42	5.801	199	14.884	-0.801	Israel	724	1337
Italy	85	5.470	275	18.569	-0.470	Italy	1554	1481
Netherlands	244	5.537	866	17.265	-0.537	Netherlands	4407	5016
Norway	10	4.608	340	14.250	0.392	Norway	217	2386
Poland	152	5.951	375	15.306	-0.951	Poland	2554	2450
Republic of North Macedonia	8	8.696	19	24.359	-3.696	Republic of North Macedonia	92	78
Russia	7	5.833	34	16.114	-0.833	Russia	120	211
Spain	116	5.529	515	16.485	-0.529	Spain	2098	3124
Sweden	802	4.808	1783	14.912	0.192	Sweden	16680	11957
UK	787	4.670	3039	14.247	0.330	UK	16854	21331
USA	1111	5.121	2750	13.449	-0.121	USA	21696	20448

Supplementary Table 7D: Total number and percentage of controls and cases by country of the BCAC dataset, included in the 99th percentile of the distribution when using pooled dataset (Individuals with standardized $PRS_{313} \geq 2.337$)

Country	Controls	Percentage	Cases	Percentage	Percentage of the diefference	Country	Controls	Cases
Australia	30	0.644	201	4.311	0.356	Australia	4049	4662
Belarus	6	0.806	20	2.688	0.194	Belarus	342	744
Belgium	19	0.559	148	4.356	0.441	Belgium	1823	3398
Canada	25	0.755	171	5.166	0.245	Canada	2277	3310
Denmark	39	0.912	153	3.579	0.088	Denmark	5241	4275
Finland	17	0.599	122	4.299	0.401	Finland	2083	2838
France	18	1.398	50	3.882	-0.398	France	1372	1288
Germany	92	0.515	783	4.379	0.485	Germany	8563	17881
Greece	10	0.799	71	5.671	0.201	Greece	607	1252
Ireland	5	0.631	27	3.405	0.369	Ireland	719	793
Israel	11	0.823	56	4.188	0.177	Israel	724	1337
Italy	13	0.878	96	6.482	0.122	Italy	1554	1481
Netherlands	58	1.156	270	5.383	-0.156	Netherlands	4407	5016
Norway	1	0.042	91	3.814	0.958	Norway	217	2386
Poland	29	1.184	102	4.163	-0.184	Poland	2554	2450
Republic of North Macedonia	0	0.000	3	3.846	1.000	Republic of North Macedonia	92	78
Russia	2	0.948	6	2.844	0.052	Russia	120	211
Spain	19	0.608	161	5.154	0.392	Spain	2098	3124
Sweden	157	1.313	529	4.424	-0.313	Sweden	16680	11957
UK	151	0.708	848	3.975	0.292	UK	16854	21331
USA	238	1.164	809	3.956	-0.164	USA	21696	20448

Supplementary Table 8: Total number and percentage of controls and cases in each percentile of the standardized PRS_{313} distribution (standardized by the controls) in Greece, Italy and Ireland of the BCAC dataset. Associations between overall breast cancer risk and PRS_{313} by percentiles.

Greece

Percentiles	Controls	Percentage	Cases	Percentage	OR (95% CI)	Cut-offs values
<1%	7	1.2	8	0.6	0.63 (0.22-1.83)	[min, -1.88176607)
1-5%	24	4	29	2.3	0.66 (0.37-1.20)	[-1.88176607, -1.24389310)
5-10%	30	4.9	20	1.6	0.37 (0.20-0.67)	[-1.24389310, -1.01592260)
10-20%	61	10	61	4.9	0.55 (0.36-0.84)	[-1.01592260, -0.61338082)
20-40%	121	19.9	172	13.7	0.78 (0.57-1.08)	[-0.61338082, -0.03013492)
40-60%	121	19.9	220	17.6	REF[1]	[-0.03013492, 0.47473869)
60-80%	121	19.9	301	24	1.37 (1.01-1.86)	[0.47473869, 1.07401938)
80-90%	61	10	152	12.1	1.37 (0.95-1.99)	[1.07401938, 1.44121042)
90-95%	30	4.9	97	7.7	1.78 (1.13-2.87)	[1.44121042, 1.74175509)
95-99%	24	4	143	11.4	3.28 (2.05-5.43)	[1.74175509, 2.54277555)
≥99%	7	1.2	49	3.9	3.85 (1.80-9.55)	[2.54277555, max]

Ireland

Percentiles	Controls	Percentage	Cases	Percentage	OR (95% CI)	Cut-offs values
<1%	8	1.1	0	0	na	[min, -2.78568527)
1-5%	28	3.9	10	1.3	0.43 (0.19-0.90)	[-2.78568527, -1.85698670)
5-10%	36	5	8	1	0.27 (0.11-0.57)	[-1.85698670, -1.41687903)
10-20%	72	10	37	4.7	0.62 (0.39-0.99)	[-1.41687903, -0.88761545)
20-40%	144	20	95	12	0.80 (0.56-1.14)	[-0.88761545, -0.35313128)
40-60%	143	19.9	118	14.9	REF[1]	[-0.35313128, 0.09498293)
60-80%	144	20	201	25.3	1.69 (1.22-2.34)	[0.09498293, 0.67706851)
80-90%	72	10	146	18.4	2.46 (1.70-3.58)	[0.67706851, 1.17758635)
90-95%	36	5	63	7.9	2.12 (1.32-3.44)	[1.17758635, 1.50563968)
95-99%	28	3.9	79	10	3.42 (2.11-5.68)	[1.50563968, 2.15571744)
≥99%	8	1.1	36	4.5	5.45 (2.56-13.04)	[2.15571744, 2.77218282]

Italy

Percentiles	Controls	Percentage	Cases	Percentage	OR (95% CI)	Cut-offs values
<1%	16	1	3	0.2	0.24 (0.06-0.74)	[min., -2.1102335)
1-5%	62	4	10	0.7	0.21 (0.10-0.40)	[-2.1102335, -1.5322247)
5-10%	78	5	33	2.2	0.55 (0.35-0.85)	[-1.5322247, -1.1617753)
10-20%	155	10	63	4.3	0.53 (0.37-0.74)	[-1.1617753, -0.7342892)
20-40%	311	20	172	11.6	0.72 (0.56-0.92)	[-0.7342892, -0.1293942)
40-60%	310	19.9	239	16.1	REF[1]	[-0.1293942, 0.3798952)
60-80%	311	20	320	21.6	1.33 (1.06-1.68)	[0.3798952, 0.9339705)
80-90%	155	10	228	15.4	1.91 (1.47-2.49)	[0.9339705, 1.3848687)
90-95%	78	5	154	10.4	2.56 (1.86-3.54)	[1.3848687, 1.7086773)
95-99%	62	4	156	10.5	3.26 (2.34-4.61)	[1.7086773, 2.2943850)
≥99%	16	1	103	7	8.35 (4.94-15.03)	[2.2943850, 5.0236339]

[1] The 40-60% was used as the reference percentile

Supplementary Table 9: Associations between PRS$_{313}$ and breast cancer risk by country, when using the pooled BCAC dataset.

Country	OR (95% CI)[1]	OR (95% CI)[2] adjusted by 10 PCs
All	1.80 (1.78-1.82)	1.80 (1.78-1.82)
Australia	1.83 (1.74-1.92)	1.83 (1.75-1.93)
Belarus	1.37 (1.20-1.58)	1.39 (1.21-1.61)
Belgium[3]	1.80 (1.68-1.92)	1.85 (1.70-2.02) / 1.79 (1.68-1.92)
Canada	1.77 (1.67-1.88)	1.77 (1.66-1.88)
Denmark	1.80 (1.72-1.88)	1.80 (1.72-1.88)
Finland	1.86 (1.75-1.98)	1.86 (1.75-1.99)
France	1.83 (1.68-1.99)	1.85 (1.70-2.01)
Germany	1.83 (1.78-1.88)	1.83 (1.78-1.88)
Greece	1.66 (1.50-1.85)	1.65 (1.49-1.84)
Ireland	1.89 (1.69-2.12)	1.93 (1.72-2.16)
Israel	1.73 (1.57-1.90)	1.73 (1.57-1.90)
Italy	1.91 (1.76-2.06)	1.91 (1.76-2.07)
Netherlands	1.95 (1.86-2.04)	1.95 (1.86-2.04)
Norway[4]	1.75 (1.51-2.03)	1.81 (1.54-2.13)
Poland	1.79 (1.69-1.90)	1.79 (1.69-1.91)
Republic of North Macedonia	1.75 (1.29-2.44)	1.87 (1.34-2.67)
Russia	1.59 (1.27-2.01)	1.59 (1.26-2.03)
Spain	1.88 (1.77-2.00)	1.88 (1.77-2.00)
Sweden	1.86 (1.81-1.91)	1.86 (1.81-1.91)
UK	1.85 (1.81-1.89)	1.85 (1.81-1.89)
USA	1.67 (1.63-1.70)	1.66 (1.63-1.70)

[1] Adjusted for array and study when appropriate.

[2] Adjusted for the first 10 PCs of iCOGS and 10 PCs of OncoArray, and array and study when appropriate.

[3] For Belgium, in the second column, the first value was derived when the model was also adjusted for the LMBC PC, and the second when was not.

[4] Not adjusted for array, since OncoArray did not include controls

Supplementary Table 10: Associations between PRS_{313} and breast cancer risk by country, when excluding samples included in the training set of BCAC (as used from Mavaddat et al., 2019 AJHG (1)).

Country	Controls	Cases	OR (95% CI)[1]	OR (95% CI)[2] adjusted for 10 PCs	Mean (SE) PRS in Controls
All	28098	26618	1.64 (1.61-1.67)	1.64 (1.61-1.67)	0.047
Australia*	383	411	1.46 (1.25-1.71)	1.51 (1.29-1.77)	0.081(0.05)
Belgium	87	156	1.56 (1.19-2.07)	1.72 (1.28-2.34)	0.112(0.11)
Canada	432	168	1.61 (1.34-1.95)	1.64 (1.36-1.99)	0.2(0.05)
Denmark	142	230	1.73 (1.37-2.21)	1.80 (1.42-2.32)	-0.002(0.08)
France	370	378	1.59 (1.38-1.84)	1.60 (1.39-1.86)	0.097(0.05)
Germany	928	4118	1.59 (1.44-1.75)	1.58 (1.48-1.68)	0.041(0.03)
Greece	246	306	1.61 (1.35-1.94)	1.63 (1.36-1.97)	0.3(0.06)
Israel	145	263	1.63 (1.33-2.01)	1.64 (1.33-2.05)	0.115(0.08)
Italy*	788	744	1.78 (1.60-1.98)	1.78 (1.60-1.98)	0.07(0.04)
Netherlands*	808	782	1.54 (1.39-1.71)	1.54 (1.39-1.71)	0.047(0.04)
Poland	331	217	1.57 (1.33-1.87)	1.57 (1.32-1.87)	-0.001(0.06)
Spain	647	812	1.61 (1.44-1.79)	1.63 (1.47-1.83)	0.061(0.04)
Sweden	5052	1819	1.68 (1.59-1.79)	1.68 (1.58-1.78)	0.0003(0.01)
UK	4503	5082	1.60 (1.51-1.69)	1.61 (1.52-1.70)	0.069(0.02)
USA	13236	11132	1.64 (1.59-1.68)	1.64 (1.59-1.69)	0.047(0.01)

PRS_{313} was standardized based on the mean and SD of all controls in the dataset

[1] Adjusted for array and study when appropriate.

[2] Adjusted for the first 10 PCs of iCOGS and 10 PCs of OncoArray, and array and study when appropriate.

*Only few individuals genotyped using iCOGS, so not adjusted for array (and icogs' PCs). For Italy, also not adjusted for study.

References:

1. Mavaddat N, Michailidou K, Dennis J, Lush M, Fachal L, Lee A, et al. Polygenic Risk Scores for Prediction of Breast Cancer and Breast Cancer Subtypes. American journal of human genetics. 2019;104(1):21-34.