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| **Online Table 1.** Study design and characteristics for eight participating studies |
| **Study name, acronym** | **Design** | **Number****of Cases****/Controls** | **Source of covariate data** | **Density software** | **Mammogram Film view** | **Breast side** | **Genotyping****(GWAS or iCOGS)** |
|  |  |  | Repro-ductivevariables | Anthropometric variables | Time between mammogram and data collection |  |  | Cases | Controls |  |
| BBCC | CC | 512/367 | Quest. | Self-report | Within 30 days | Madena | CC | Average | Average | iCOGS |
| EPIC\* | Cohort | 86/968 | Quest | Measured | 3 years prior | Cumulus | MLO | Contra | Average | iCOGS |
| MCBCS | CC | 677/864 | Quest | Measured | Within 30 days | Cumulus | CC | Contra | L | iCOGS |
| MCCS\* | Nested CC | 68/28 | Quest | Measured | 3 years prior | Cumulus | CC | R | R | iCOGS |
| MEC\* | Nested CC | 110/101 | Quest | Self-report | Within 5 years prior | Cumulus | CC | Average | Average | iCOGS |
| MMHS\* | Nested CC | 456/1166 | Self | Measured | Within 30 days | Cumulus | CC | Average | Average | iCOGS |
| NHS\* | Nested CC | 850/849 | Quest | Self-report | Within 2 years | Cumulus | CC | Average | Average | GWAS |
| SASBAC\* | CC | 869/783 | Quest | Self-report | Mean 1 year post | Cumulus | MLO | Contra | L/R | iCOGS |
| \*Population-based studies. |

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| **Online Table 2.** Characteristics of cases and non-cases by study (% of non-missing). |
| **Characteristic** | **BBCC** | **EPIC** | **MCBCS** | **MCCS** | **MEC** | **MMHS** | **NHS** | **SASBAC** |
| **Cases****N=512** | **Non-cases****N=367** | **Cases****N=86** | **Non-cases****N=968** | **Cases****N=677** | **Non-cases****N=864** | **Cases****N=68** | **Non-cases****N=28** | **Cases****N=110** | **Non-cases****N=101** | **Cases****N=456** | **Non-cases****N=1166** | **Cases****N=850** | **Non-cases****N=849** | **Cases****N=869** | **Non-cases****N=783** |
|  | **%** | **%** | **%** | **%** | **%** | **%** | **%** | **%** | **%** | **%** | **%** | **%** | **%** | **%** | **%** | **%** |
| Age <50 | 17 | 25 | 0 | 0 | 27 | 17 | 7 | 11 | 11 | 27 | 18 | 20 | 6 | 6 | 1 | 1 |
| Age 50-59 | 26 | 31 | 19 | 17 | 30 | 28 | 44 | 46 | 35 | 38 | 25 | 27 | 37 | 38 | 34 | 32 |
| Age ≥ 60 | 57 | 44 | 81 | 83 | 43 | 55 | 49 | 43 | 55 | 36 | 57 | 53 | 57 | 56 | 65 | 67 |
| Parous | 84 | 82 | 84 | 87 | 88 | 85 | 85 | 93 | 84 | 79 | 88 | 89 | 92 | 94 | 87 | 92 |
| Post-menopausal | 80 | 79 | 78 | 76 | 72 | 81 | 78 | 89 | 92 | 72 | 75 | 75 | 92 | 91 | 97 | 98 |
| Ever HRT (Post meno) | 39 | 55 | 33 | 37 | 64 | 74 | 22 | 24 | 80 | 82 | 67 | 66 | 74 | 72 | 52 | 43 |
| BMI ≥ 25 | 55 | 44 | 67 | 65 | 64 | 67 | 63 | 57 | 44 | 46 | 70 | 65 | 51 | 49 | 51 | 53 |
| Family Hx BC | -- | -- | 12 | 8 | 23 | 19 | -- | -- | 10 | 6 | 31 | 21 | 16 | 12 | 15 | 9 |

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| **Online Table 3.** Associations (OR, 95% CI) of adjusted percent density (PD), adjusted dense area (DA) and polygenic risk score (PRS) with breast cancer by study. Adjusted for age and BMI. |
| **Model** | **BBCC****(512/367)** **OR (95% CI)** | **EPIC\*****(86/968)****OR (95% CI)** | **MCBCS****(677/864)****OR (95% CI)** | **MCCS\*****(68/28)****OR (95% CI)** | **MEC\*****(110/101)****OR (95% CI)** | **MMHS\* (456/1166)****OR (95% CI)** | **NHS\*****(850/849)****OR (95% CI)** | **SASBAC\*****(869/783)****OR (95% CI)** |
| PD (per SD)  | 1.2 (1.0, 1.4) | 1.3 (1.0, 1.7) | 1.9 (1.7, 2.2) | 1.6 (1.0, 2.6) | 1.5 (1.2, 1.9) | 1.7 (1.5, 1.9) | 1.4 (1.3, 1.6) | 1.3 (1.2, 1.4) |
| PD Quartiles 12 (ref)34 | 1.4 (0.4, 5.1)ref1.0 (0.6, 1.8)1.6 (1.0, 2.7) | 0.9 (0.5, 1.9)ref1.4 (0.7, 2.5)1.8 (1.0, 3.3) | 0.5 (0.4, 0.7)ref1.5 (1.1, 1.9)2.4 (1.8, 3.2) | 0.8 (0.3, 2.7)ref2.0 (0.5, 8.4)3.7 (0.8, 17.9) | 0.5 (0.2, 1.3)ref1.4 (0.5, 4.1)1.7 (0.7, 3.8) | 0.4 (0.3, 0.6)ref1.2 (0.9, 1.6)1.7 (1.3, 2.3) | 0.7 (0.5, 1.0)ref1.4 (1.0, 1.9)1.9 (1.4, 2.6) | 0.6 (0.4, 0.8)ref1.1 (0.8, 1.4)1.0 (0.7, 1.3) |
| DA (per SD)  | 0.9 (0.8, 1.1) | 1.3 (1.0, 1.6) | 1.7 (1.5, 2.0) | 1.7 (1.0, 3.0) | 1.7 (1.3, 2.3) | 1.6 (1.4, 1.9) | 1.3 (1.2, 1.4) | 1.3 (1.1, 1.4) |
| DA Quartiles 12 (ref)34 | 1.2 (0.2, 7.3)ref0.5 (0.2, 1.1)0.5 (0.2, 1.1) | 1.1 (0.6, 2.2)ref0.9 (0.5, 1.8)1.6 (0.9, 2.8) | 0.5 (0.4, 0.7)ref1.3 (1.0, 1.7)1.7 (1.3, 2.4) | 0.9 (0.3, 2.7)ref1.6 (0.4, 6.4)3.8 (0.6, 22.1) | 0.4 (0.2, 1.0)ref1.3 (0.5, 3.1)1.9 (0.8, 4.2) | 0.5 (0.4, 0.7)ref1.3 (1.0, 1.7)1.5 (1.1, 2.2) | 0.6 (0.4, 0.8)ref1.1 (0.8, 1.5)1.7 (1.3, 2.3) | 0.6 (0.4, 0.8)ref1.1 (0.8, 1.5)1.0 (0.7, 1.3) |
| PRS (per SD)  | 1.3 (1.1, 1.5) | 1.4 (1.1, 1.8) | 1.5 (1.3, 1.6) | 1.2 (0.7, 2.0) | 1.6 (1.2, 2.1) | 1.6 (1.4, 1.8) | 1.6 (1.4, 1.8) | 1.6 (1.4, 1.7) |
| PRS Quintiles 123 (ref)45 | 0.8 (0.5, 1.3)0.8 (0.5, 1.3)Ref1.2 (0.8, 1.8)1.5 (1.0, 2.3) | 0.6 (0.3, 1.3)0.4 (0.2, 0.9)Ref1.0 (0.5, 1.9)1.1 (0.6, 2.1) | 0.4 (0.3, 0.6)0.8 (0.5, 1.1)Ref1.4 (1.0, 1.9)1.3 (0.9, 1.7) | 0.6 (0.1, 2.6)2.8 (0.6, 13.4)Ref1.9 (0.5, 7.7)1.5 (0.4, 5.3) | 0.3 (0.1, 0.9)0.7 (0.2, 2.0)Ref1.2 (0.5, 3.1)1.4 (0.6, 3.3) | 0.5 (0.3, 0.5)0.7 (0.5, 1.0)Ref1.3 (0.9, 1.8)1.7 (1.2, 2.4) | 0.6 (0.4, 0.8)0.8 (0.6, 1.1)Ref1.3 (1.0, 1.8)2.1 (1.6, 2.8) | 0.4 (0.3, 0.6)0.9 (0.6, 1.2)Ref1.3 (0.9, 1.7)1.8 (1.3, 2.4) |
| \*Population-based studies used for analyses of joint associations. |

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| **Online Table 4.** Goodness of fit test p-values for joint effect of adjusted\* density measures with 77-SNP polygenic risk score (PRS) on breast cancer, based on six population-based studies. PRS and density measures are continuous (per 1 standard deviation, SD) |
| **Variables included in models with 77-SNP PRS (per SD)** | **N studies\*\*** | **N Cases/controls** | **Tail-based** **goodness of fit test** | **Hosmer and Lemeshow** **goodness of fit test** |
|  |  |  | No interaction | With interaction | No interaction | With interaction |
| Adjusted\* percent density (per SD) | 6 | 2439/3895 | 0.23 | 0.70 | 0.09 | 0.09 |
| Adjusted\* dense area (per SD) | 6 | 2439/3895 | 0.44 | 0.88 | 0.27 | 0.39 |
| \*Residuals from model adjusted for age, 1/BMI and study\*\*Population-based studies include MEC, MMHS, MCCS, NHS, EPIC, SASBAC |