

Supplementary Table 1. Details of antibodies and staining equipment for immunohistochemical stains

| Antibody | Clone | Manufacturer | Catalogue number | Stainer |
|----------|--------------------------|--------------|------------------|--------------------------|
| ER | SP1 (rabbit monoclonal) | Roche | 790-4325 | Roche Ventana XT |
| PR | 1E2 (rabbit monoclonal) | Roche | 790-4296 | Roche Ventana XT |
| HER2 | 4B5 (rabbit monoclonal) | Roche | 790-4493 | Roche Ventana XT |
| EGFR | 5B7 (rabbit monoclonal) | Roche | 790-4347 | Roche Ventana XT |
| Ki67 | MIB-1 (mouse monoclonal) | Maixin | MAB-0129 | Roche Ventana XT |
| CK5/6 | MX040 (mouse monoclonal) | Maixin | MAB-0276 | Dako Autostainer Link 48 |
| TP53 | MX008 (mouse monoclonal) | Maixin | MAB-0142 | Leica RM2235 |

Supplementary Table 2. Odds ratios and 95% confidence intervals for the associations between breast cancer risk factors and phenotypes (p53+ vs p53-) of luminal A-like breast cancer among younger (≤ 50 years) and older women (> 50 years)

| Characteristic | ≤ 50 years | | > 50 years | |
|------------------------|-------------------|---------|----------------------|----------|
| | p53+ vs p53- | | p53+ vs p53- | |
| | OR (95% CI) | p-value | OR (95% CI) | p-value |
| Age at Menarche | | | | |
| ≤ 12 yrs. | 1.00 (reference) | | 1.00 (reference) | |
| 13 yrs. | 0.82 (0.52, 1.27) | 0.37 | 1.60 (0.94, 2.75) | 0.08 |
| 14 yrs. | 0.69 (0.45, 1.05) | 0.09 | 1.23 (0.73, 2.09) | 0.43 |
| ≥ 15 yrs. | 0.95 (0.64, 1.40) | 0.79 | 1.29 (0.80, 2.08) | 0.29 |
| <i>p_trend</i> | | 0.89 | | 0.97 |
| Parity | | | | |
| None | 1.00 (reference) | | 1.00 (reference) | |
| 1 | 2.07 (1.16, 3.70) | 0.01 | 15.23 (2.03, 114.42) | 0.01 |
| 2 | 2.36 (1.25, 4.47) | 0.01 | 13.22 (1.75, 99.91) | 0.01 |
| ≥ 3 | 2.22 (0.95, 5.12) | 0.06 | 20.21 (2.63, 155.31) | < 0.01 |
| <i>p_trend</i> | | 0.06 | | 0.06 |
| Breastfeed | | | | |
| Never | 1.00 (reference) | | 1.00 (reference) | |
| Ever | 1.34 (0.91, 1.98) | 0.14 | 1.47 (0.92, 2.33) | 0.10 |
| BMI, kg/m ² | | | | |
| ≤ 18.5 | 1.07 (0.43, 2.68) | 0.88 | 0.67 (0.20, 2.22) | 0.51 |
| 18.5-24.99 | 1.00 (reference) | | 1.00 (reference) | |
| 25-30 | 1.04 (0.79, 1.38) | 0.77 | 1.01 (0.77, 1.32) | 0.93 |
| > 30 | 1.07 (0.64, 1.79) | 0.78 | 0.87 (0.56, 1.34) | 0.52 |
| Family History | | | | |
| Absent | 1.00 (reference) | | 1.00 (reference) | |
| Present | 1.08 (0.67, 1.75) | 0.73 | 0.82 (0.51, 1.32) | 0.42 |

Odds ratios and 95% confidence interval were obtained from subtype-specific logistic regression models mutually adjusted for age, age at menarche, parity, breastfeeding, BMI and family history of breast cancer.

Supplementary Table 3. Adjusted odds ratios and 95% confidence intervals for the associations between breast cancer clinicopathological and epidemiological factors and p53 expression in luminal A-like breast cancer defined using different cutoff-points for ER and PR expression

| Characteristic | Luminal A-like (1% ER and PR) | | Luminal A-like (10% ER and PR) | | Luminal A-like (20% ER and PR) | |
|-------------------|-------------------------------|---------|--------------------------------|---------|--------------------------------|---------|
| | p53+ vs p53- | | p53+ vs p53- | | p53+ vs p53- | |
| | OR (95% CI) | p-value | OR (95% CI) | p-value | OR (95% CI) | p-value |
| Age, yrs. | | | | | | |
| <40 | 1.00 (reference) | | 1.00 (reference) | | 1.00 (reference) | |
| 40-50 | 1.04 (0.81, 1.32) | 0.76 | 1.12 (0.87, 1.44) | 0.38 | 1.07 (0.80, 1.44) | 0.62 |
| 50-60 | 0.83 (0.65, 1.06) | 0.14 | 0.84 (0.65, 1.09) | 0.19 | 0.78 (0.58, 1.06) | 0.11 |
| 60-70 | 0.78 (0.59, 1.03) | 0.08 | 0.83 (0.62, 1.11) | 0.21 | 0.76 (0.55, 1.06) | 0.11 |
| 70+ | 0.62 (0.44, 0.88) | <0.01 | 0.72 (0.50, 1.04) | 0.08 | 0.78 (0.51, 1.19) | 0.24 |
| <i>p_trend</i> | | <0.01 | | 0.03 | | 0.04 |
| Histologic grade | | | | | | |
| Well diff. | 1.00 (reference) | | 1.00 (reference) | | 1.00 (reference) | |
| Mod. diff. | 1.69 (1.35, 2.12) | <0.01 | 1.41 (1.11, 1.80) | <0.01 | 1.32 (1.00, 1.73) | 0.05 |
| Tumor size | | | | | | |
| <2cm | 1.00 (reference) | | 1.00 (reference) | | 1.00 (reference) | |
| 2-5cm | 1.18 (0.95, 1.47) | 0.13 | 1.01 (0.80, 1.27) | 0.91 | 1.20 (0.90, 1.59) | 0.21 |
| >5cm | 1.14 (0.57, 2.27) | 0.71 | 0.90 (0.44, 1.84) | 0.77 | 0.87 (0.37, 2.01) | 0.75 |
| <i>p_trend</i> | | 0.15 | | 0.95 | | 0.26 |
| Nodal Involvement | | | | | | |
| 0 | 1.00 (reference) | | 1.00 (reference) | | 1.00 (reference) | |
| 1-3 | 0.99 (0.84, 1.17) | 0.92 | 0.94 (0.79, 1.12) | 0.49 | 0.94 (0.76, 1.15) | 0.53 |
| >3 | 1.16 (0.95, 1.40) | 0.14 | 1.10 (0.89, 1.35) | 0.37 | 1.09 (0.87, 1.39) | 0.45 |
| KI67 | | | | | | |
| Q1 (<10) | 1.00 (reference) | | 1.00 (reference) | | 1.00 (reference) | |
| Q2 (10-20) | 1.28 (1.05, 1.55) | 0.02 | 1.32 (1.07, 1.62) | <0.01 | 1.38 (1.07, 1.79) | 0.01 |
| Q3 (20-35) | 1.77 (1.45, 2.14) | <0.01 | 1.78 (1.44, 2.19) | <0.01 | 1.97 (1.53, 2.55) | <0.01 |
| Q4 (>35) | 2.47 (1.88, 3.24) | <0.01 | 2.43 (1.82, 3.24) | <0.01 | 2.49 (1.77, 3.51) | <0.01 |
| <i>p_trend</i> | | <0.01 | | <0.01 | | <0.01 |
| CK5/6 | | | | | | |
| Negative | 1.00 (reference) | | 1.00 (reference) | | 1.00 (reference) | |
| Positive | 1.55 (0.85, 2.80) | 0.15 | 0.91 (0.45, 1.85) | 0.80 | 1.38 (0.58, 3.26) | 0.46 |
| EGFR | | | | | | |
| Negative | 1.00 (reference) | | 1.00 (reference) | | 1.00 (reference) | |
| Positive | 1.95 (1.41, 2.69) | <0.01 | 1.79 (1.24, 2.57) | <0.01 | 1.77 (1.18, 2.67) | <0.01 |
| Age at Menarche | | | | | | |
| ≤12 yrs. | 1.00 (reference) | | 1.00 (reference) | | 1.00 (reference) | |
| 13 yrs. | 1.07 (0.76, 1.50) | 0.69 | 1.08 (0.76, 1.53) | 0.65 | 1.05 (0.73, 1.52) | 0.78 |
| 14 yrs. | 0.86 (0.62, 1.19) | 0.37 | 0.85 (0.60, 1.18) | 0.33 | 0.83 (0.58, 1.18) | 0.30 |
| ≥15 yrs. | 1.02 (0.76, 1.50) | 0.91 | 1.01 (0.75, 1.37) | 0.92 | 1.06 (0.77, 1.45) | 0.72 |
| <i>p_trend</i> | | 0.99 | | 0.98 | | 0.68 |
| Parity | | | | | | |
| None | 1.00 (reference) | | 1.00 (reference) | | 1.00 (reference) | |
| 1 | 2.67 (1.59, 4.51) | <0.01 | 2.88 (1.67, 4.96) | <0.01 | 3.23 (1.80, 5.81) | <0.01 |
| 2 | 2.63 (1.52, 4.55) | <0.01 | 2.93 (1.66, 5.17) | <0.01 | 3.40 (1.85, 6.27) | <0.01 |
| >3 | 3.67 (2.01, 6.71) | <0.01 | 3.94 (2.10, 7.40) | <0.01 | 4.58 (2.34, 8.99) | <0.01 |
| <i>p_trend</i> | | <0.01 | | <0.01 | | <0.01 |
| Breastfeed | | | | | | |
| Never | 1.00 (reference) | | 1.00 (reference) | | 1.00 (reference) | |
| Ever | 1.38 (1.03, 1.85) | 0.03 | 1.46 (1.08, 1.97) | 0.01 | 1.66 (1.20, 2.30) | <0.01 |
| BMI | | | | | | |
| ≤18.5 | 0.90 (0.44, 1.85) | 0.78 | 1.02 (0.47, 2.22) | 0.95 | 1.00 (0.43, 2.33) | 0.99 |
| 18.5-24.99 | 1.00 (reference) | | 1.00 (reference) | | 1.00 (reference) | |
| 25-30 | 1.01 (0.84, 1.23) | 0.88 | 1.00 (0.82, 1.22) | 0.96 | 1.05 (0.85, 1.30) | 0.62 |
| >30 | 0.93 (0.67, 1.30) | 0.68 | 0.88 (0.63, 1.24) | 0.47 | 1.00 (0.70, 1.42) | 0.99 |
| Family History | | | | | | |
| Absent | 1.00 (reference) | | 1.00 (reference) | | 1.00 (reference) | |
| Present | 0.97 (0.69, 1.35) | 0.84 | 0.95 (0.67, 1.34) | 0.75 | 0.91 (0.63, 1.32) | 0.62 |

Odds ratios and 95% confidence intervals were from mutually adjusted multivariate polytomous logistic models separately for clinicopathological features and epidemiological factors.