Supplemental Online Content

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This supplemental material has been provided by the authors to give readers additional information about their work.
eFigure 1. CONSORT Diagram of the Analytic Cohort

All non-metastatic breast cancer cases in Utah cancer registry* (UCR) (N=56,153)

Exclusion of cases diagnosed** >45 years of age (n=47,627)

Young women breast cancer between >15 and ≤45 years of age (n=8,526)

Exclusion of cases diagnosed before 1996 (n=4,150)

Cancer cases diagnosed since 1996 (n=4,376)

Exclusion of late stage (SEER 7, 86%) and unknown (SEER 9, 14%) breast cancers (n=227)

Localized and Regional Cancer cases (SEER stages 0-4) (N=4,149)

Exclusion of cases missing from Utah Cancer Registry (UCR) (n=87)

Cancer cases matched with UCR (N=4,062 in UCR data file)

Exclusion of Cases with 2 or more primary cancers (n=299)

Cases diagnosed with only one breast cancer in lifetime (N=3,556)

Exclusion Cases with breast cancers diagnosed ≤ 3 month apart (n= 207)

Cases included in the study (N=2977)

Exclusion of Cases diagnosed with in situ cancer (n=579)

Cases included in the study (N=2970)

Exclusion of Primigravida Cases (n=7)

Nulliparous cases with breast cancer (n=860)

Parous cases with breast cancer (n=2,110)

- PPBC 0- <5 years (n=614)
- Parous 5- to <10 years (n=615)
- Parous ≥10 years (n=881)

*Utah Cancer registry SEER DMS database – include SEER reportable cases, Utah resident at diagnosis, exclude cases only reported by VA hospital, exclude cases reported by other state registries, ambiguous diagnosis included

**2 additional cases < 15 years old excluded

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This diagram depicts how cases from the Utah Population Database were selected for inclusion in our analytic cohort. In brief, non-metastatic, invasive breast cancer cases diagnosed between 01/01/1996 and 12/31/2017 were included in the cohort (N = 2970).
eFigure 2. Tumor Size by Parity Group
### eTable 1. UPDB’s Breast Cancer Cohort

|                    | Nulliparous (N=860, 29.1%) | PPBC <5 years (N=614, 20.6%) | PPBC 5-<10 years (N=615, 20.7%) | PPBC ≥10 (N=881, 29.6%) |
|--------------------|-----------------------------|-----------------------------|-------------------------------|--------------------------|
| No. (%)            | No. (%)                     | No. (%)                     | No. (%)                       | No. (%)                  |
| Mean age at diagnosis (SD) | 38.8 (5.7)                     | 35.6 (5.0)                     | 39.5 (4.1)                   | 42.2 (2.7)               |
| Median age in PPBC <5 years | Age ≤ 36 (N=240) | Age > 36 (N=620) | Age ≤ 36 (N=334) | Age > 36 (N=280) | Age ≤ 36 (N=131) | Age > 36 (N=484) | Age ≤ 36 (N=36) | Age > 36 (N=845) |
| Estrogen status     |                             |                             |                               |                          |
| ER+                | 169 (73.2)                  | 473 (79.8)                  | 223 (68.8)                  | 214 (78.4)               | 94 (73.4)               | 373 (80)               | 27 (77.1)               | 635 (77.6)               |
| ER-                | 62 (26.8)                   | 120 (20.2)                  | 101 (31.2)                  | 59 (21.6)                | 34 (26.6)               | 93 (20)                 | 8 (22.9)                 | 183 (22.4)               |
| Missing            | 14                          | 29                         | 10                          | 7                        | 3                      | 18                      | 27                       |
| Lymph Node         |                             |                             |                               |                          |
| Yes                | 108 (47)                    | 275 (45.6)                  | 206 (62.6)                  | 154 (57.5)               | 59 (46.5)               | 198 (42)                | 16 (45.7)                | 335 (40.7)               |
| No                 | 122 (53)                    | 328 (54.4)                  | 123 (37.4)                  | 114 (42.5)               | 68 (53.5)               | 273 (58)                | 19 (54.3)                | 488 (59.3)               |
| No Nodes examined  | 15                          | 19                         | 5                           | 12                       | 4                      | 13                      | 1                        | 22                       |
| Tumor size         |                             |                             |                               |                          |
| 0.1—≤2.0 cm        | 112 (49.1)                  | 331 (55.5)                  | 126 (39.5)                  | 133 (50.2)               | 72 (58.1)               | 248 (53)                | 19 (54.3)                | 475 (58.6)               |
| >2.0—≤5.0 cm       | 88 (38.6)                   | 217 (36.4)                  | 145 (45.5)                  | 94 (35.5)                | 37 (29.8)               | 183 (39.1)              | 14 (40)                  | 292 (36)                 |
| >5.0 cm            | 28 (12.3)                   | 48 (8.1)                    | 48 (15)                     | 38 (14.3)                | 15 (12.1)               | 37 (7.9)                | 2 (5.7)                  | 43 (5.3)                 |
| Missing            | 12                          | 24                         | 15                          | 15                       | 7                      | 16                      | 1                        | 35                       |
| Stage              |                             |                             |                               |                          |
| I                  | 84 (40.2)                   | 246 (49.4)                  | 71 (26.7)                   | 87 (36.9)                | 52 (47.7)               | 194 (46.4)              | 16 (57.1)                | 375 (53)                 |
| II                 | 93 (44.5)                   | 203 (40.8)                  | 136 (51.1)                  | 105 (44.5)               | 33 (30.3)               | 174 (41.6)              | 9 (32.1)                 | 261 (36.9)               |
| III                | 32 (15.3)                   | 49 (9.8)                    | 59 (22.2)                   | 44 (18.6)                | 24 (22)                 | 50 (12)                 | 3 (10.7)                 | 71 (10)                  |
| Missing            | 36                          | 124                        | 68                          | 44                       | 22                     | 66                      | 8                        | 138                      |
| Biologic subtype   |                             |                             |                               |                          |

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|                      | 1996-1998 | 1999-2004 | 2005-2017 | 1996-1998 | 1999-2004 | 2005-2017 | 1996-1998 | 1999-2004 | 2005-2017 | 1996-1998 | 1999-2004 | 2005-2017 | 1996-1998 | 1999-2004 | 2005-2017 | 1996-1998 | 1999-2004 | 2005-2017 | 1996-1998 | 1999-2004 | 2005-2017 | 1996-1998 | 1999-2004 | 2005-2017 | 1996-1998 | 1999-2004 | 2005-2017 | 1996-1998 | 1999-2004 | 2005-2017 |
|----------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Luminal A (ER+, PR+/-, Her2 neu-) | 52 (51)   | 159 (71)  | 83 (53.5) | 91 (65)   | 35 (61.4) | 161 (72.2) | 13 (76.5) | 251 (68.2) |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |
| Luminal B (ER+, PR+/-, Her2 neu+) | 27 (26.5) | 34 (15.2) | 37 (23.9) | 25 (17.9) | 10 (17.5) | 26 (11.7)  | 2 (11.8)  | 50 (13.6)  |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |
| Her2 neu positive (ER+, PR-)     | 10 (9.8)  | 9 (4)     | 13 (8.4)  | 8 (5.7)   | 6 (10.5)  | 14 (6.3)   | 0 (0)     | 18 (4.9)   |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |
| Triple negative                 | 13 (12.7) | 22 (9.8)  | 22 (14.2) | 16 (11.4) | 6 (10.5)  | 22 (9.9)   | 2 (11.8)  | 49 (13.3)  |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |
| Unknown Her2 neu                | 136       | 384       | 175       | 139       | 73        | 258       | 19        | 474       |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |
| Unknown/Other                   | 2         | 12        | 4         | 1         | 1         | 3         | 0         | 3         |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |
| **Year of Diagnosis**           |          |           |           |           |           |           |           |           |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |
| 1996-1998                       | 23 (9.4)  | 71 (11.4) | 31 (9.3)  | 18 (6.4)  | 15 (11.5) | 45 (9.3)   | 4 (11.1)  | 96 (11.4)  |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |
| 1999-2004                       | 46 (18.8) | 162 (26.1)| 61 (18.3) | 58 (20.7) | 28 (21.4) | 92 (19)    | 11 (30.6) | 210 (24.9) |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |
| 2005-2017                       | 176 (71.8)| 389 (62.5)| 242 (72.5)| 204 (72.9)| 88 (67.2) | 347 (71.7) | 21 (58.3) | 539 (63.8) |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |
| **Patients with Metastasis**    | 33 (13.5) | 67 (10.8) | 78 (23.4) | 40 (14.3) | 15 (11.5) | 65 (13.4)  | 7 (19.4)  | 93 (11)   |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |

**Note:**
Abbreviations: PPBC, Postpartum Breast Cancer; No., number of patients per group; ER, estrogen receptor; PR, progesterone receptor;
### eTable 2. Frequency Distribution of Known First Site of Metastasis by Estrogen Receptor Status

| Known First Site of Metastasis | ER+ (n=2203) | ER- (n=658) |
|-------------------------------|-------------|-------------|
|                               | Total n of Metastasis | Nulliparous | PPBC 0-5 | Parous 5-<10 | Parous ≥10 | Total n of Metastasis | Nulliparous | PPBC 0-5 | Parous 5-<10 | Parous ≥10 |
| Bone                          | 130 (46%)   | 36 (28%)    | 31 (24%) | 30 (23%) | 33 (25%) | 22 (25%) | 3 (14%)    | 7 (32%)    | 5 (23%) | 7 (32%)    |
| Liver                         | 108 (38%)   | 28 (26%)    | 38 (35%) | 18 (17%) | 24 (22%) | 33 (37.5%) | 8 (24%) | 12 (36%) | 4 (12%) | 9 (28%) |
| Brain + Nervous System        | 32 (11%)    | 11 (34%)    | 12 (38%) | 7 (22%) | 2 (6%) | 29 (33%) | 3 (10%) | 10 (34%) | 6 (21%) | 10 (35%) |
| Lung                          | 12 (4%)     | 2 (17%)     | 2 (17%) | 3 (25%) | 5 (42%) | 3 (3%) | 1 (33%)    | 0          | 0 | 2 (67%) |
| Kidney                        | 0           | 0           | 0       | 0       | 0 (1%) | 0 (14%) | 0          | 0 | 0 | 1 (100%) |
| Total                         | 282 (12.8%) | 77 (27%)    | 83 (29%) | 58 (21%) | 64 (23%) | 88 (13.4%) | 15 (17%) | 29 (33%) | 15 (17%) | 29 (33%) |

a. Percentages based on total number of participants with ER+ (n=2203)
b. Percentages based on total number of participants with ER- (n=658)
c. Percentages based on total number of participants with known first site of metastasis in ER+ group (n=282)
d. Percentages based on total number of participants with known first site of metastasis in ER- group (n=88)
e. Percentages on number of participants with known first site of metastasis by estrogen receptor status and site of metastasis (row percentage).
**eTable 3. Multivariate Cox Proportional Regression Model for Time Since Recent Childbirth in Association with Distant Metastasis and Breast Cancer–Specific Mortality (Entire Cohort: Stage I, II, III, or Unknown)**

| Variable | Levels | Hazard Ratio | 95% HR CI | P value | Overall P | Hazard Ratio | 95% HR CI | P value | Overall P |
|----------|--------|--------------|-----------|---------|-----------|--------------|-----------|---------|-----------|
| Time since recent childbirth | Nulliparous | Reference | | | 0.02 | Reference | | | | 0.039 |
| | PPBC <5 | 1.5 | 1.2-2.0 | 0.002 | | 1.5 | 1.1-2.1 | 0.004 | |
| | Parous 5 to <10 | 1.2 | 0.9-1.6 | 0.25 | | 1.3 | 0.9-1.7 | 0.110 | |
| | Parous >=10 | 1.1 | 0.8-1.5 | 0.57 | | 1.2 | 0.9-1.6 | 0.315 | |
| Diagnosis Year | 1996-1998 | Reference | | | <.001 | Reference | | | <.001 |
| | 1999-2004 | 0.8 | 0.6-1.1 | 0.15 | | 0.8 | 0.6-1.1 | 0.109 | |
| | 2005-2017 | 0.5 | 0.4-0.7 | <.001 | | 0.4 | 0.3-0.6 | <.001 | |
| Diagnosis Age | 1 | | | | 0.06 | 1.0 | 0.97-1.0 | 0.644 | 0.64 |
| AJCC Stage | I | Reference | | | <.001 | Reference | | | <.001 |
| | II | 2.6 | 1.9-3.6 | <.001 | | 2.6 | 1.9-3.7 | <.001 | |
| | III | 5.9 | 4.1-8.5 | <.001 | | 7.3 | 4.9-10.7 | <.001 | |
| | Unknown | 4.5 | 3.3-6.2 | <.001 | | 5.1 | 3.7-7.1 | <.001 | |
| ER | Positive/Elevated | Reference | | | 0.88 | Reference | | | 0.001 |
| | Negative/Normal | 1 | 0.8-1.2 | 0.8416 | | 1.6 | 1.2-2.0 | <.001 | |
| | Unknown | 0.9 | 0.5-1.5 | 0.6236 | | 0.96 | 0.6-1.6 | 0.888 | |