## Supplemental Table 1
Clinical and pathologic features at presentation by retinoblastoma protein status

|                           | Retinoblastoma Protein Status | 0 (≤1%) | 1 (≥1% - <10%) | 2 (≥10% - <50%) | 3 (≥50%) |
|---------------------------|------------------------------|---------|----------------|-----------------|--------|
|                           | n=68                         | n=21    | n=14           | n=77            |        |
| Age at diagnosis (yrs)—mean ± SD |                      | 45.7 ± 9.4 | 46.4 ± 11.4     | 49.6 ± 11.3     | 47.7 ± 10.9 |
| BRCA status—n (%)          |                              |         |                |                 |        |
| Carrier                   |                              | 34 (50.0) | 11 (52.4)      | 5 (35.7)        | 21 (27.3) |
| Sporadic                  |                              | 33 (49.5) | 10 (47.6)      | 9 (64.3)        | 56 (72.7) |
| Unknown                   |                              | 1 (1.5)  | 0 (0.0)        | 0 (0.0)         | 0 (0.0)   |
| Invasive histology—n (%)   |                              |         |                |                 |        |
| Ductal                    |                              | 60 (88.2) | 21 (100.0)     | 13 (92.9)       | 66 (85.7) |
| Lobular                   |                              | 4 (5.9)  | 0 (0.0)        | 1 (7.1)         | 5 (6.5)   |
| Mixed                     |                              | 0 (0.0)  | 0 (0.0)        | 0 (0.0)         | 1 (1.3)   |
| Metaplastic               |                              | 1 (1.5)  | 0 (0.0)        | 0 (0.0)         | 0 (0.0)   |
| Unknown                   |                              | 3 (4.4)  | 0 (0.0)        | 0 (0.0)         | 5 (6.5)   |
| Tumor size (cm)—median (IQR)\(^1\) |          | 1.9 (1.3-2.9) | 1.7 (1.5-2.5) | 2.3 (1.3-4.5) | 2.0 (1.5-3.0) |
| Tumor grade—n (%)         |                              |         |                |                 |        |
| 1                         |                              | 0 (0.0)  | 0 (0.0)        | 0 (0.0)         | 1 (1.3)   |
| 2                         |                              | 1 (1.5)  | 1 (4.8)        | 2 (14.3)        | 6 (7.8)   |
| 3                         |                              | 67 (98.5)| 20 (95.2)      | 10 (71.4)       | 69 (89.6) |
| Unknown                   |                              | 0 (0.0)  | 0 (0.0)        | 2 (14.3)        | 1 (1.3)   |
| Lymphovascular invasion—n (%) |                          |         |                |                 |        |
| Present                   |                              | 21 (30.9)| 7 (33.3)       | 4 (28.6)        | 32 (41.6) |
| Absent                    |                              | 45 (66.2)| 13 (61.9)      | 10 (71.4)       | 45 (58.4) |
| Unknown                   |                              | 2 (2.9)  | 1 (4.8)        | 0 (0.0)         | 0 (0.0)   |
| Positive lymph nodes—n (%) |                              |         |                |                 |        |
| Present                   |                              | 10 (14.7)| 3 (14.3)       | 6 (42.9)        | 24 (31.2) |
| Absent                    |                              | 21 (30.9)| 6 (28.6)       | 2 (14.3)        | 25 (32.5) |
| Unknown                   |                              | 37 (54.4)| 12 (57.1)      | 6 (42.9)        | 28 (36.4) |
| T classification—n (%)    |                              |         |                |                 |        |
| T1                        |                              | 40 (58.8)| 14 (66.7)      | 7 (50.0)        | 40 (52.0) |
| T2                        |                              | 19 (27.9)| 5 (23.8)       | 5 (35.7)        | 26 (33.8) |
| T3                        |                              | 4 (5.9)  | 0 (0.0)        | 0 (0.0)         | 3 (3.9)   |
| T4                        |                              | 2 (2.9)  | 0 (0.0)        | 0 (0.0)         | 2 (2.6)   |
| Unknown                   |                              | 3 (4.4)  | 2 (9.5)        | 2 (14.3)        | 6 (7.8)   |
| N classification—n (%)    |                              |         |                |                 |        |
| N0                        |                              | 34 (50.0)| 14 (66.7)      | 3 (21.4)        | 37 (48.1) |
| N1                        |                              | 21 (30.9)| 4 (19.1)       | 7 (50.0)        | 20 (26.0) |
| N2                        |                              | 2 (2.9)  | 1 (4.8)        | 2 (14.4)        | 10 (13.0) |
| N3                        |                              | 2 (2.9)  | 1 (4.8)        | 0 (0.0)         | 2 (2.6)   |
| Unknown                   |                              | 9 (13.2)| 1 (4.8)        | 2 (14.3)        | 8 (10.4)  |
| AJCC Stage—n (%)          |                              |         |                |                 |        |
| 1                         |                              | 18 (26.5)| 10 (47.6)      | 1 (7.1)         | 17 (22.1) |
| 2                         |                              | 27 (39.7)| 6 (28.6)       | 9 (64.3)        | 36 (46.8) |
| 3                         |                              | 7 (10.3)| 2 (9.5)        | 2 (14.3)        | 13 (16.9) |
| 4                         |                              | 2 (2.9)  | 0 (0.0)        | 0 (0.0)         | 0 (0.0)   |
| Unknown                   |                              | 14 (20.6)| 3 (14.3)       | 2 (14.3)        | 11 (14.3) |

Abbreviations: SD, standard deviation; IQR, interquartile range; AJCC, American Joint Committee on Cancer

\(^1\)Tumor size is missing for one woman in the retinoblastoma protein <1% group
### Supplemental Table 2
### Molecular features at presentation by retinoblastoma protein status

| Molecular feature                        | Retinoblastoma Protein Status | 0 (<1%) n=68 | 1 (≥1% - <10%) n=21 | 2 (≥10% - <50%) n=14 | 3 (≥50%) n=77 |
|-----------------------------------------|------------------------------|--------------|---------------------|---------------------|--------------|
| Androgen receptor—n (%)                |                              |              |                     |                     |              |
| Negative/ weakly positive               |                              | 64 (94.1)    | 20 (95.2)           | 11 (78.6)          | 63 (81.8)    |
| Positive (>10%)                         |                              | 2 (2.9)      | 1 (4.8)             | 3 (21.4)           | 12 (15.6)    |
| Unknown                                 |                              | 2 (2.9)      | 0 (0.0)             | 0 (0.0)            | 2 (2.6)      |
| p53—n (%)                               |                              |              |                     |                     |              |
| Negative                                |                              | 27 (39.7)    | 9 (42.9)            | 7 (50.0)           | 20 (26.0)    |
| Low positive                            |                              | 1 (1.5)      | 0 (0.0)             | 2 (14.9)           | 4 (5.2)      |
| Positive                                |                              | 34 (50.0)    | 11 (52.4)           | 5 (35.7)           | 47 (61.0)    |
| Unknown                                 |                              | 6 (8.8)      | 1 (4.8)             | 0 (0.0)            | 6 (7.8)      |
| Epidermal growth factor receptor—n (%) |                              |              |                     |                     |              |
| No staining                             |                              | 14 (20.6)    | 5 (23.8)            | 5 (35.7)           | 20 (26.0)    |
| ≥ 10% positive                          |                              | 52 (76.5)    | 14 (66.7)           | 8 (57.1)           | 55 (71.4)    |
| Positive, unknown amount                |                              | 0 (0.0)      | 1 (4.8)             | 0 (0.0)            | 0 (0.0)      |
| Unknown                                 |                              | 292.9        | 1 (4.8)             | 1 (7.1)            | 2 (2.6)      |
| Cytokeratin 5/6—n (%)                   |                              |              |                     |                     |              |
| No staining                             |                              | 21 (30.9)    | 10 (47.6)           | 6 (42.9)           | 31 (40.3)    |
| ≥ 10% positive                          |                              | 45 (66.2)    | 10 (47.6)           | 8 (57.1)           | 44 (57.1)    |
| Positive, unknown amount                |                              | 0 (0.0)      | 1 (4.8)             | 0 (0.0)            | 0 (0.0)      |
| Unknown                                 |                              | 2 (2.9)      | 0 (0.0)             | 0 (0.0)            | 2 (2.6)      |
| Cytokeratin 14—n (%)                    |                              |              |                     |                     |              |
| No staining                             |                              | 33 (48.5)    | 12 (57.1)           | 9 (64.3)           | 40 (51.9)    |
| ≥ 10% positive                          |                              | 33 (48.5)    | 8 (38.1)            | 5 (35.7)           | 36 (46.8)    |
| Positive, unknown amount                |                              | 0 (0.0)      | 1 (4.8)             | 9 (64.3)           | 0 (0.0)      |
| Unknown                                 |                              | 2 (2.9)      | 0 (0.0)             | 0 (0.0)            | 1 (1.3)      |
| PD-L1 cancer—n (%)                      |                              |              |                     |                     |              |
| Negative                                |                              | 49 (72.1)    | 14 (66.7)           | 12 (85.7)          | 56 (72.7)    |
| Positive (≥1%)                          |                              | 16 (23.5)    | 6 (28.6)            | 2 (14.3)           | 19 (24.7)    |
| Unknown                                 |                              | 3 (4.4)      | 1 (4.8)             | 0 (0.0)            | 2 (2.6)      |