

Table S1 SMD of age

Characteristics	Level		SMD
	Negative	Positive	
N	56,500	56,500	
Race, n (%)			0.01
White	44,527 (78.81)	44,734 (79.18)	
Black	6,221 (11.01)	6,068 (10.74)	
Asian or Pacific Islander	5,107 (9.04)	5,041 (8.92)	
Others	645 (1.14)	657 (1.16)	
Primary site, n (%)			0.023
Upper-outer quadrant	20,365 (36.04)	20,249 (35.84)	
Upper-inner quadrant	5,101 (9.03)	5,087 (9.00)	
Lower-outer quadrant	4,358 (7.71)	4,661 (8.25)	
Lower-inner quadrant	2,791 (4.94)	2,693 (4.77)	
Central portion & nipple	3,293 (5.83)	3,403 (6.02)	
Others	20,592 (36.45)	20,407 (36.12)	
Histology, n (%)			0.009
Infiltrating duct carcinoma	42,409 (75.06)	42,215 (74.72)	
Lobular carcinoma	5,965 (10.56)	6,093 (10.78)	
Mucinous adenocarcinoma	331 (0.59)	326 (0.58)	
Others	7,795 (13.80)	7,866 (13.92)	
Breast subtype, n (%)			0.019
HR ⁺ /HER2 ⁻	40,689 (72.02)	41,128 (72.79)	
HR ⁻ /HER2 ⁻	5,126 (9.07)	5,041 (8.92)	
HR ⁺ /HER2 ⁺	5,736 (10.15)	5,630 (9.96)	
HR ⁻ /HER2 ⁺	2,255 (3.99)	2,141 (3.79)	
Others	2,694 (4.77)	2,560 (4.53)	
Grade, n (%)			0.021
Grade I	8,505 (15.05)	8,722 (15.44)	
Grade II	26,189 (46.35)	26,383 (46.70)	
Grade III	20,277 (35.89)	20,006 (35.41)	
Grade IV	169 (0.30)	153 (0.27)	
Unknown	1,360 (2.41)	1,236 (2.19)	
AJCC T, n (%)			0.009
T1mic	230 (0.41)	231 (0.41)	
T1a	1,027 (1.82)	1,020 (1.81)	
T1b	4,488 (7.94)	4,491 (7.95)	
T1c	20,015 (35.42)	20,086 (35.55)	
T2	27,558 (48.78)	27,453 (48.59)	
T3	3,103 (5.49)	3,155 (5.58)	
Unknown	79 (0.14)	64 (0.11)	

+, positive; -, negative. SMD, standardized mean difference; HR, hormone receptor; HER2, human epidermal growth factor receptor 2; AJCC T, the T staging of Cancer Staging Manual of the American Joint Committee on Cancer; mic, microinvasive carcinoma.

Table S2 SMD of race

Characteristics	Level		SMD
	Negative	Positive	
N	56,080	56,080	
Age (years), n (%)			0.007
20–44	6,736 (12.01)	6,864 (12.24)	
45–55	14,680 (26.18)	14,659 (26.14)	
56+	34,664 (61.81)	34,557 (61.62)	
Primary site, n (%)			0.012
Upper-outer quadrant	20,275 (36.15)	20,126 (35.89)	
Upper-inner quadrant	5,055 (9.01)	5,075 (9.05)	
Lower-outer quadrant	4,693 (8.37)	4,616 (8.23)	
Lower-inner quadrant	2,743 (4.89)	2,685 (4.79)	
Central portion & nipple	3,362 (6.00)	3,333 (5.94)	
Others	19,952 (35.58)	20,245 (36.10)	
Histology, n (%)			0.008
Infiltrating duct carcinoma	42,044 (74.97)	41,884 (74.69)	
Lobular carcinoma	5,954 (10.62)	6,062 (10.81)	
Mucinous adenocarcinoma	314 (0.56)	326 (0.58)	
Others	7,768 (13.85)	7,808 (13.92)	
Breast subtype, n (%)			0.017
HR ⁺ /HER2 ⁻	40,529 (72.27)	40,831 (72.81)	
HR ⁻ /HER2 ⁻	5,236 (9.34)	5,020 (8.95)	
HR ⁺ /HER2 ⁺	5,530 (9.86)	5,555 (9.91)	
HR ⁻ /HER2 ⁺	2,235 (3.99)	2,125 (3.79)	
Others	2,550 (4.55)	2,549 (4.55)	
Grade, n (%)			0.013
Grade I	8,757 (15.62)	8,683 (15.48)	
Grade II	25,818 (46.04)	26,182 (46.69)	
Grade III	20,082 (35.81)	19,824 (35.35)	
Grade IV	152 (0.27)	155 (0.28)	
Unknown	1,271 (2.27)	1,236 (2.20)	
AJCC T, 7 th , n (%)			0.01
T1mic	256 (0.46)	231 (0.41)	
T1a	992 (1.77)	1,020 (1.82)	
T1b	4,398 (7.84)	4,491 (8.01)	
T1c	20,161 (35.95)	20,086 (35.82)	
T2	27,121 (48.36)	27,118 (48.36)	
T3	3,087 (5.50)	3,070 (5.47)	
Unknown	65 (0.12)	64 (0.11)	

+, positive; -, negative. SMD, standardized mean difference; HR, hormone receptor; HER2, human epidermal growth factor receptor 2; AJCC T, the T staging of Cancer Staging Manual of the American Joint Committee on Cancer; mic, microinvasive carcinoma.

Table S3 SMD of primary site

Characteristics	Level		SMD
	Negative	Positive	
N	56,582	56,582	
Age (years), n (%)			0.011
20–44	6,818 (12.05)	7,009 (12.39)	
45–55	15,023 (26.55)	14,852 (26.25)	
56+	34,741 (61.40)	34,721 (61.36)	
Race, n (%)			0.013
White	44,641 (78.90)	44,789 (79.16)	
Black	6,331 (11.19)	6,113 (10.80)	
Asian or Pacific Islander	4,942 (8.73)	5,028 (8.89)	
Others	668 (1.18)	652 (1.15)	
Histology, n (%)			0.011
Infiltrating duct carcinoma	42,387 (74.91)	42,274 (74.71)	
Lobular carcinoma	5,932 (10.48)	6,115 (10.81)	
Mucinous adenocarcinoma	325 (0.57)	326 (0.58)	
Others	7,938 (14.03)	7,867 (13.90)	
Breast subtype, n (%)			0.011
HR ⁺ /HER2 ⁻	41,046 (72.54)	41,167 (72.76)	
HR ⁻ /HER2 ⁻	5,105 (9.02)	5,068 (8.96)	
HR ⁺ /HER2 ⁺	5,610 (9.91)	5,634 (9.96)	
HR ⁻ /HER2 ⁺	2,263 (4.00)	2,148 (3.80)	
Others	2,558 (4.52)	2,565 (4.53)	
Grade, n (%)			0.013
Grade I	8,747 (15.46)	8,723 (15.42)	
Grade II	26,046 (46.03)	26,363 (46.59)	
Grade III	20,339 (35.95)	20,099 (35.52)	
Grade IV	155 (0.27)	156 (0.28)	
Unknown	1,295 (2.29)	1,241 (2.19)	
AJCC T, 7 th , n (%)			0.01
T1mic	211 (0.37)	231 (0.41)	
T1a	1,038 (1.83)	1,020 (1.80)	
T1b	4,433 (7.83)	4,491 (7.94)	
T1c	20,165 (35.64)	20,086 (35.50)	
T2	27,554 (48.70)	27,486 (48.58)	
T3	3,121 (5.52)	3,204 (5.66)	
Unknown	60 (0.11)	64 (0.11)	

+, positive; -, negative. SMD, standardized mean difference; HR, hormone receptor; HER2, human epidermal growth factor receptor 2; AJCC T, the T staging of Cancer Staging Manual of the American Joint Committee on Cancer; mic, microinvasive carcinoma.

Table S4 SMD of histology

Characteristics	Level		SMD
	Negative	Positive	
N	56,134	56,134	
Age (years), n (%)			0.018
20–44	6,574 (11.71)	6,871 (12.24)	
45–55	14,936 (26.61)	14,669 (26.13)	
56+	34,624 (61.68)	34,594 (61.63)	
Race, n (%)			0.016
White	44,215 (78.77)	44,509 (79.29)	
Black	6,220 (11.08)	5,966 (10.63)	
Asian or Pacific Islander	5,066 (9.02)	5,006 (8.92)	
Others	633 (1.13)	653 (1.16)	
Primary site, n (%)			0.006
Upper-outer quadrant	20,048 (35.71)	20,100 (35.81)	
Upper-inner quadrant	5,035 (8.97)	5,077 (9.04)	
Lower-outer quadrant	4,689 (8.35)	4,618 (8.23)	
Lower-inner quadrant	2,711 (4.83)	2,680 (4.77)	
Central portion & nipple	3,429 (6.11)	3,400 (6.06)	
Others	20,222 (36.02)	20,259 (36.09)	
Breast subtype, n (%)			0.011
HR ⁺ /HER2 ⁻	40,834 (72.74)	40,867 (72.80)	
HR ⁻ /HER2 ⁻	5,090 (9.07)	5,042 (8.98)	
HR ⁺ /HER2 ⁺	5,596 (9.97)	5,552 (9.89)	
HR ⁻ /HER2 ⁺	2,023 (3.60)	2,128 (3.79)	
Unknown	2,591 (4.62)	2,545 (4.53)	
Grade, n (%)			0.012
Grade I	8,786 (15.65)	8,718 (15.53)	
Grade II	25,916 (46.17)	26,221 (46.71)	
Grade III	20,018 (35.66)	19,797 (35.27)	
Grade IV	145 (0.26)	156 (0.28)	
Unknown	1,269 (2.26)	1,242 (2.21)	
AJCC T, 7 th , n (%)			0.006
T1mic	220 (0.39)	231 (0.41)	
T1a	1,004 (1.79)	1,020 (1.82)	
T1b	4,492 (8.00)	4,491 (8.00)	
T1c	20,073 (35.76)	20,086 (35.78)	
T2	27,124 (48.32)	27,047 (48.18)	
T3	3,152 (5.62)	3,195 (5.69)	
Unknown	69 (0.12)	64 (0.11)	

+, positive; -, negative. SMD, standardized mean difference; HR, hormone receptor; HER2, human epidermal growth factor receptor 2; AJCC T, the T staging of Cancer Staging Manual of the American Joint Committee on Cancer; mic, microinvasive carcinoma.

Table S5 SMD of breast subtype

Characteristics	Level		SMD
	Negative	Positive	
N	56,748	56,748	
Age (years), n (%)			0.011
20–44	6,935 (12.22)	7,129 (12.56)	
45–55	15,110 (26.63)	14,950 (26.34)	
56+	34,703 (61.15)	34,669 (61.09)	
Race, n (%)			0.012
White	44,750 (78.86)	44,857 (79.05)	
Black	6,386 (11.25)	6,196 (10.92)	
Asian or Pacific Islander	4,977 (8.77)	5,036 (8.87)	
Others	635 (1.12)	659 (1.16)	
Primary site, n (%)			0.018
Upper-outer quadrant	20,529 (36.18)	20,348 (35.86)	
Upper-inner quadrant	5,152 (9.08)	5,083 (8.96)	
Lower-outer quadrant	4,654 (8.20)	4,679 (8.25)	
Lower-inner quadrant	2,854 (5.03)	2,701 (4.76)	
Central portion & nipple	3,427 (6.04)	3,417 (6.02)	
Others	20,132 (35.48)	20,520 (36.16)	
Histology, n (%)			0.006
Infiltrating duct carcinoma	42,418 (74.75)	42,460 (74.82)	
Lobular carcinoma	6,106 (10.76)	6,093 (10.74)	
Mucinous adenocarcinoma	304 (0.54)	326 (0.57)	
Others	7,920 (13.96)	7,869 (13.87)	
Grade, n (%)			0.011
Grade I	8,750 (15.42)	8,686 (15.31)	
Grade II	26,112 (46.01)	26,400 (46.52)	
Grade III	20,468 (36.07)	20,255 (35.69)	
Grade IV	151 (0.27)	157 (0.28)	
Unknown	1,267 (2.23)	1,250 (2.20)	
AJCC T, 7 th , n (%)			0.011
T1mic	225 (0.40)	231 (0.41)	
T1a	1,034 (1.82)	1,020 (1.80)	
T1b	4,342 (7.65)	4,491 (7.91)	
T1c	20,220 (35.63)	20,086 (35.40)	
T2	27,770 (48.94)	27,705 (48.82)	
T3	3,094 (5.45)	3,151 (5.55)	
Unknown	63 (0.11)	64 (0.11)	

SMD, standardized mean difference; AJCC T, the T staging of Cancer Staging Manual of the American Joint Committee on Cancer; mic, microinvasive carcinoma.

Table S6 SMD of grade

Characteristics	Level		SMD
	Negative	Positive	
N	56,265	56,265	
Age (years), n (%)			0.008
20–44	6,768 (12.03)	6,862 (12.20)	
45–55	14,925 (26.53)	14,745 (26.21)	
56+	34,572 (61.44)	34,658 (61.60)	
Race, n (%)			0.018
White	44,404 (78.92)	44,621 (79.31)	
Black	6,255 (11.12)	5,965 (10.60)	
Asian or Pacific Islander	4,992 (8.87)	5,026 (8.93)	
Others	614 (1.09)	653 (1.16)	
Primary site, n (%)			0.014
Upper-outer quadrant	20,076 (35.68)	20,198 (35.90)	
Upper-inner quadrant	4,916 (8.74)	5,082 (9.03)	
Lower-outer quadrant	4,709 (8.37)	4,618 (8.21)	
Lower-inner quadrant	2,753 (4.89)	2,686 (4.77)	
Central portion & nipple	3,418 (6.07)	3,382 (6.01)	
Others	20,393 (36.24)	20,299 (36.08)	
Histology, n (%)			0.008
Infiltrating duct carcinoma	42,163 (74.94)	41,979 (74.61)	
Lobular carcinoma	5,999 (10.66)	6,089 (10.82)	
Mucinous adenocarcinoma	334 (0.59)	326 (0.58)	
Others	7,769 (13.81)	7,871 (13.99)	
Breast subtype, n (%)			0.023
HR ⁺ /HER2 ⁻	40,680 (72.30)	41,003 (72.87)	
HR ⁻ /HER2 ⁻	5,335 (9.48)	5,019 (8.92)	
HR ⁺ /HER2 ⁺	5,563 (9.89)	5,575 (9.91)	
HR ⁻ /HER2 ⁺	2,226 (3.96)	2,116 (3.76)	
Unknown	2,461 (4.37)	2,552 (4.54)	
AJCC T, 7 th , n (%)			0.011
T1mic	223 (0.40)	231 (0.41)	
T1a	1,035 (1.84)	1,020 (1.81)	
T1b	4,473 (7.95)	4,491 (7.98)	
T1c	20,059 (35.65)	20,086 (35.70)	
T2	27,320 (48.56)	27,151 (48.26)	
T3	3,093 (5.50)	3,222 (5.73)	
Unknown	62 (0.11)	64 (0.11)	

+, positive. -, negative. SMD, standardized mean difference; HR, hormone receptor; HER2, human epidermal growth factor receptor 2; AJCC T, the T staging of Cancer Staging Manual of the American Joint Committee on Cancer; mic, microinvasive carcinoma.

Table S7 SMD of derived AJCC T, 7th

Characteristics	Level		SMD
	Negative	Positive	
N	59,485	59,485	
Age (years), n (%)			0.011
20–44	7,584 (12.75)	7,674 (12.90)	
45–55	16,223 (27.27)	15,926 (26.77)	
56+	35,678 (59.98)	35,885 (60.33)	
Race, n (%)			0.013
White	46,908 (78.86)	47,051 (79.10)	
Black	6,839 (11.50)	6,631 (11.15)	
Asian or Pacific Islander	5,103 (8.58)	5,126 (8.62)	
Others	635 (1.07)	677 (1.14)	
Primary site, n (%)			0.006
Upper-outer quadrant	21,330 (35.86)	21,205 (35.65)	
Upper-inner quadrant	5,064 (8.51)	5,108 (8.59)	
Lower-outer quadrant	4,837 (8.13)	4,813 (8.09)	
Lower-inner quadrant	2,732 (4.59)	2,720 (4.57)	
Central portion & nipple	3,828 (6.44)	3,891 (6.54)	
Others	21,694 (36.47)	21,748 (36.56)	
Histology, n (%)			0.011
Infiltrating duct carcinoma	43,985 (73.94)	44,137 (74.20)	
Lobular carcinoma	6,661 (11.20)	6,707 (11.28)	
Mucinous adenocarcinoma	313 (0.53)	326 (0.55)	
Others	8,526 (14.33)	8,315 (13.98)	
Breast subtype, n (%)			0.015
HR ⁺ /HER2 ⁻	43,040 (72.35)	43,298 (72.79)	
HR ⁻ /HER2 ⁻	5,344 (8.98)	5,155 (8.67)	
HR ⁺ /HER2 ⁺	5,954 (10.01)	6,031 (10.14)	
HR ⁻ /HER2 ⁺	2,428 (4.08)	2,334 (3.92)	
Unknown	2,719 (4.57)	2,667 (4.48)	
Grade, n (%)			0.006
Grade I	8,761 (14.73)	8,787 (14.77)	
Grade II	27,632 (46.45)	27,700 (46.57)	
Grade III	21,622 (36.35)	21,548 (36.22)	
Grade IV	153 (0.26)	166 (0.28)	
Unknown	1,317 (2.21)	1,284 (2.16)	

+, positive; -, negative. SMD, standardized mean difference; AJCC T, the T staging of Cancer Staging Manual of the American Joint Committee on Cancer; HR, hormone receptor; HER2, human epidermal growth factor receptor 2.