

Supplementary Materials

Supplementary Table S1. Patient and cancer- and treatment-related characteristics.

Patient Characteristics	No. Patients (%)
Age	
< 45	1104 (17.8)
≥45	5115 (82.2)
Ethnicity	
White	4632 (74.5)
Black	732 (11.8)
Other	855 (13.7)
Grade	
I+II	2454 (58.4)
III+IV	1751 (41.6)
Unknown	2014
ER status	
Negative	1650 (31.3)
Positive	3618 (68.7)
Unknown	951
PR status	
Negative	2286 (44.8)
Positive	2819 (55.2)
Unknown	1114
HER2 status	
Negative	818 (60.8)
Positive	527 (39.2)
Unknown	4874
LN status	
N0	5193 (92.3)
N1	369 (6.6)
N2	55 (1.0)
N3	11 (0.2)
Unknown	591
Radiotherapy	

No	3288 (53.1)
Yes	2900 (46.9)
Unknown	31
Chemotherapy	
No	5611 (90.2)
Yes	608 (9.8)
LN surgery	
No	580(9.4)
SLNB	4102(66.4)
ALND	1496(24.2)
Unknown	41
Breast surgery	
Lumpectomy	3388(54.5)
Mastectomy	2831(45.5)

Abbreviations: ER=estrogen receptor; PR=progesterone receptor; HER2=human epidermal growth factor receptor2; LN=lymph node; SLNB=sentinel lymph node biopsy; ALND=axillary lymph node dissection.

Supplementary Table S2. Baseline characteristics of lymph-node negative patients treated with chemotherapy or without chemotherapy.

Variables	Original, Unmatched Cohort						Propensity-Matched Cohort							
	No- chemothera py		Chemotherapy		P-value	No- chemother apy		Chemotherapy		P-value				
	No.	%	No.	%		No.	%	No.	%					
Age							< 0.001							0.808
< 45	456	16.7	51	27.1				46	25.6	44	24.4			
≥45	2272	83.3	137	72.9				134	74.4	136	75.6			
Ethnicity							0.442							0.714
White	2040	74.8	133	70.7				132	73.3	130	72.2			
Black	316	11.6	24	12.8				22	12.2	19	10.6			
Other	372	13.6	31	16.5				26	14.4	31	17.2			
Grade							< 0.001							0.828
I+II	1646	60.3	73	38.8				68	37.8	70	38.9			
III+IV	1083	39.7	115	61.2				112	62.2	110	61.1			
ER status							< 0.001							0.459
Negative	782	28.7	109	58.0				94	52.2	101	56.1			
Positive	1946	71.3	79	42.0				86	47.8	79	43.9			
PR status							< 0.001							0.267
Negative	1156	42.4	131	69.7				113	62.8	123	68.3			
Positive	1572	57.6	57	30.3				67	37.2	57	31.7			
Radiotherapy							0.144							0.749
No	1388	50.9	106	56.4				106	58.9	103	57.2			
Yes	1340	49.1	82	43.6				74	41.1	77	42.8			
LN surgery							< 0.001							0.063
SLNB	2169	79.5	123	65.4				105	58.3	122	67.8			
ALND	559	20.5	65	34.6				75	41.7	58	32.2			
Breast Surgery							0.013							0.752
Lumpectomy	1532	56.2	88	46.8				87	48.3	84	46.7			
Mastectomy	1196	43.8	100	53.2				93	51.7	96	53.3			

Abbreviations: ER=estrogen receptor; PR=progesterone receptor; LN=lymph node;

SLNB=sentinel lymph node biopsy; ALND=axillary lymph node dissection.

Supplementary Table S3. Univariate and multivariate Cox regression analysis for overall and breast cancer-specific survival in LN-negative patients.

Variables	Overall survival				Breast cancer-specific survival			
	Univariate analysis		Multivariate analysis		Univariate analysis		Multivariate analysis	
	HR (95% CI)	P-value	HR (95% CI)	P-value	HR (95% CI)	P-value	HR (95% CI)	P-value
Age								
< 45	Reference		Reference		Reference		Reference	
≥45	1.938 (1.205-3.117)	0.006	2.119 (1.311-3.426)	0.002	0.491 (0.267-0.905)	0.023	0.627 (0.335-1.173)	0.144
Ethnicity								
White	Reference		Reference		Reference		Reference	
Black	2.496 (1.771-3.519)	< 0.001	2.507 (1.773-3.543)	< 0.001	2.478 (1.207-5.085)	0.013	2.357 (1.128-4.925)	0.023
Others	0.533 (0.301-0.944)	0.031	0.513 (0.289-0.909)	0.022	1.626 (0.770-3.436)	0.203	1.380 (0.650-2.929)	0.401
Grade								
I + II	Reference		Reference		Reference		Reference	
III + IV	0.878 (0.614-1.255)	0.474	0.816 (0.563-1.181)	0.280	2.244 (1.116-4.513)	0.023	1.721 (0.837-3.538)	0.140
Unknown	0.998 (0.707-1.408)	0.989	0.940 (0.662-1.334)	0.729	1.254 (0.572-2.748)	0.572	1.119 (0.505-2.478)	0.781
ER								
Negative	Reference		Reference		Reference		Reference	

SLNB	Reference	Reference	Reference	Reference
ALND	1.472 (1.086-1.994) 0.013	1.246 (0.913-1.702) 0.166	2.313 (1.291-4.146) 0.005	1.581 (0.864-2.894) 0.137
Unknown	2.176 (0.689-6.875) 0.185	2.312 (0.725-7.373) 0.157	3.550 (0.477- 26.415) 0.216	5.599 (0.735- 42.677) 0.096
Breast surgery				
Lumpectomy	Reference	Reference	Reference	Reference
Mastectomy	1.492 (1.113-2.000) 0.008	0.907 (0.598-1.376) 0.647	3.373 (1.755-6.484) < 0.001	1.138 (0.555-3.126) 0.531

Abbreviations: HR=hazard ratio, CI=confidence interval, ER=estrogen receptor; PR=progesterone receptor; HER2=human epidermal growth factor receptor2; LN=lymph node; SLNB=sentinel lymph node biopsy; ALND=axillary lymph node dissection.

Supplementary Table S4. Univariate and multivariate Cox regression analysis for overall and breast cancer-specific survival in LN-positive patients.

Variables	Overall survival				Breast cancer-specific survival			
	Univariate analysis		Multivariate analysis		Univariate analysis		Multivariate analysis	
	HR (95% CI)	P-value	HR (95% CI)	P-value	HR (95% CI)	P-value	HR (95% CI)	P-value
Age								
< 45	Reference		Reference		Reference		Reference	
≥45	1.488 (0.760-2.913)	0.246	1.360 (0.669-2.764)	0.396	1.428 (0.612-3.330)	0.410	1.452 (0.598-3.523)	0.410
Ethnicity								
White	Reference		Reference		Reference		Reference	
Black	1.776 (0.963-3.272)	0.066	1.641 (0.863-3.119)	0.131	1.504 (0.665-3.399)	0.327	1.490 (0.640-3.469)	0.356
Others	0.211 (0.029-1.545)	0.126	0.189 (0.025-1.422)	0.106	0.366 (0.049-2.726)	0.327	0.363 (0.047-2.785)	0.330
Grade								
I + II	Reference		Reference		Reference		Reference	
III + IV	1.312 (0.700-2.457)	0.397	1.178 (0.592-2.344)	0.641	1.473 (0.637-3.403)	0.365	1.351 (0.546-3.338)	0.515
Unknown	0.770 (0.343-1.731)	0.528	0.714 (0.310-1.640)	0.427	1.098 (0.408-2.954)	0.852	1.100 (0.393-3.081)	0.855
ER								
Negative	Reference		Reference		Reference		Reference	

Positive	0.740 (0.398-1.379)	0.343	1.287 (0.585-2.833)	0.531	0.876 (0.383-2.003)	0.754	1.881 (0.659-5.366)	0.237
Unknown	1.045 (0.449-2.431)	0.919	1.356 (0.285-6.451)	0.702	1.575 (0.558-4.444)	0.391	2.497 (0.320-19.483)	0.383
PR								
Negative	Reference		Reference		Reference		Reference	
Positive	0.468 (0.243-0.901)	0.023	0.428 (0.196-0.934)	0.033	0.462 (0.196-1.090)	0.078	0.359 (0.130-0.988)	0.047
Unknown	0.981 (0.468-2.055)	0.959	0.892 (0.224-3.555)	0.871	1.237 (0.501-3.054)	0.644	0.812 (0.129-5.096)	0.824
HER2 status								
Negative	Reference		Reference		Reference		Reference	
Positive	999 (0-999)	0.936	999 (0-999)	0.951	1.007 (0-999)	0.999	0.741 (0-999)	0.999
Unknown	999 (0-999)	0.933	999 (0-999)	0.949	26.732 (0.005-999)	0.455	999 (0-999)	0.964
Radiotherapy								
No	Reference		Reference		Reference		Reference	
Yes	1.315 (0.737-2.347)	0.354	1.859 (0.957-3.609)	0.067	1.396 (0.666-2.925)	0.377	1.672 (0.723-3.868)	0.230
Unknown	8.599 (1.160-63.737)	0.035	5.622 (0.700-45.132)	0.104	12.417 (1.637-94.199)	0.015	7.903 (0.917-68.143)	0.060
Chemotherapy								
No	Reference		Reference		Reference		Reference	
Yes	0.958 (0.521-1.759)	0.889	0.816 (0.412-1.615)	0.559	1.692 (0.692-4.141)	0.249	1.702 (0.639-4.533)	0.288

LN surgery							
SLNB	Reference		Reference		Reference		Reference
ALND	1.229 (0.611-2.472)	0.563	1.079 (0.513-2.270)	0.842	1.344 (0.549-3.294)	0.518	1.021 (0.395-2.641) 0.965
Unknown	< 0.001 (0-999)	0.977	< 0.001 (0-999)	0.989	< 0.001 (0-999)	0.981	0 (0-999) 0.993
Breast surgery							
Lumpectomy	Reference		Reference		Reference		Reference
Mastectomy	1.787 (0.837-3.812)	0.133	2.488 (1.091-5.673)	0.030	1.754 (0.671-4.582)	0.251	2.423 (0.850-6.904) 0.098

Abbreviations: HR=hazard ratio, CI=confidence interval, ER=estrogen receptor; PR=progesterone receptor; HER2=human epidermal growth factor receptor2; LN=lymph node; SLNB=sentinel lymph node biopsy; ALND=axillary lymph node dissection.

Supplementary Figure S1

