Supplementary Materials:

Supplementary Figure and Table legend

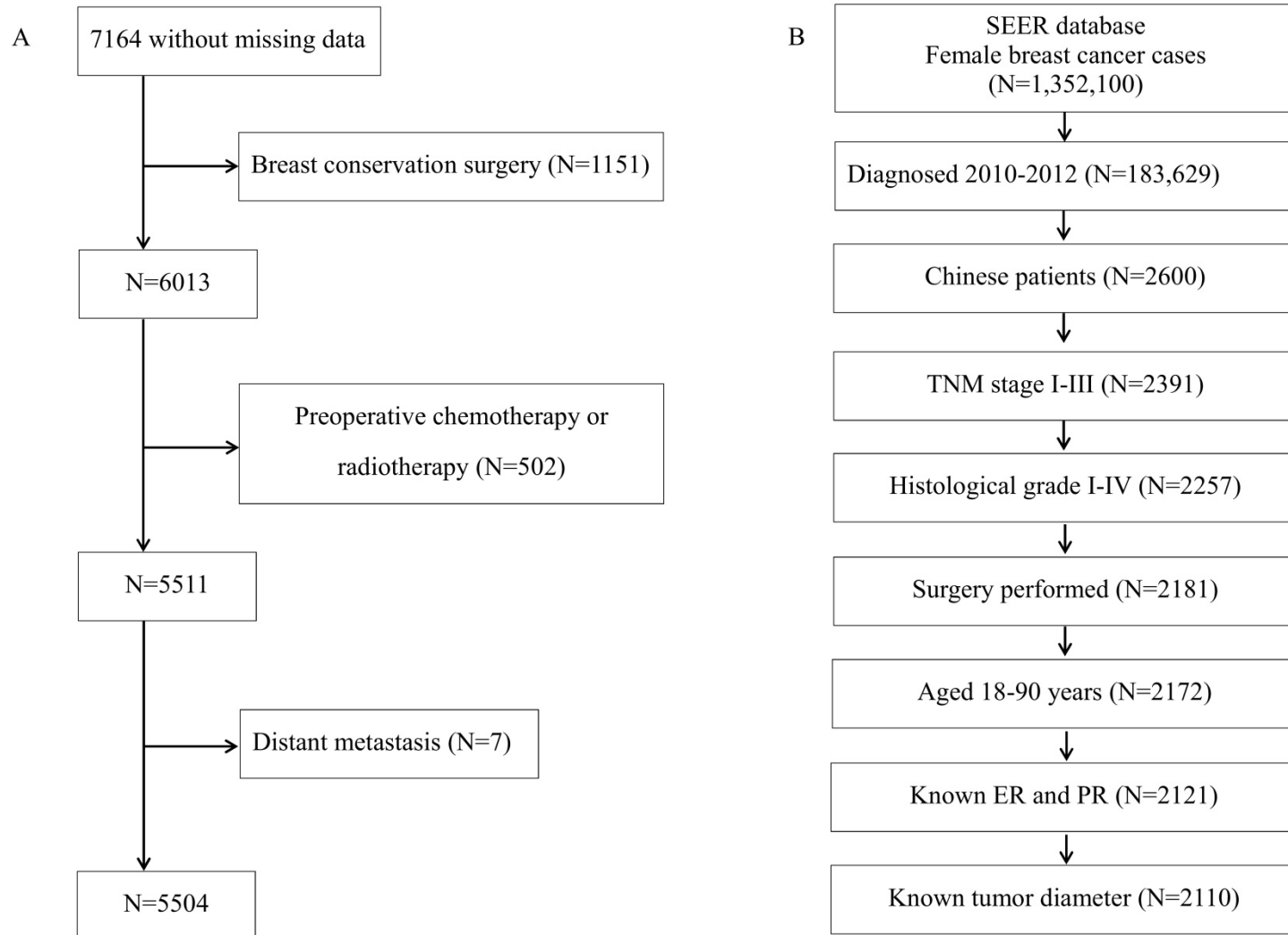Figure S1: Flowchart of the subjects' selection for the TBCCC cohort (A) and the SERR cohort (B).

Table S1: Comparison of different models for evaluating breast cancer prognosis

Table S2: Difference in the demographic and clinical factors between the subjects receiving chemotherapy and without in total population.

Table S3: Difference in the demographic and clinical factors between the subjects receiving chemotherapy and without in low risk population.

Table S4: Difference in the demographic and clinical factors between the subjects receiving chemotherapy and without in mediate risk population.

Table S5: Difference in the demographic and clinical factors between the subjects receiving chemotherapy and in high risk population.

A
7164 without missing data

→ Breast conservation surgery (N=1151)

N=6013

→ Preoperative chemotherapy or radiotherapy (N=502)

N=5511

→ Distant metastasis (N=7)

N=5504

B
SEER database
Female breast cancer cases
(N=1,352,100)

↓

Diagnosed 2010-2012 (N=183,629)

↓

Chinese patients (N=2600)

↓

TNM stage I-III (N=2391)

↓

Histological grade I-IV (N=2257)

↓

Surgery performed (N=2181)

↓

Aged 18-90 years (N=2172)

↓

Known ER and PR (N=2121)

↓

Known tumor diameter (N=2110)

Figure S1: Flowchart of the subjects' selection for the TBCCC cohort (A) and the SERR cohort (B).

Table S1: Comparison of different models for evaluating breast cancer prognosis

Models	Population	Factors	Outcomes
PREDICT	Eastern Cancer Registration and Information Centre (ECRIC) dataset	Age at diagnosis, menopausal status, ER status, HER2 status, Ki-67 status, Tumor size, Tumor grade, positive nodes number, and diagnosis type (screening or symptoms)	Breast cancer specific mortality and mortality from other causes
MammaPrint	Primary breast cancer patients	70 genes associated with breast cancer recurrence	Breast cancer recurrence
OncotypeDX	NSABP trial B-14	21 genes associated with breast cancer recurrence	Breast cancer distant recurrence
MSKCC nomogram	Breast cancer procedures of axillary SLN biopsy performed at Memorial Sloan-Kettering Cancer Center	Age, tumor size, tumor type, lymphovascular invasion, tumor location, multifocality, and ER status and PR status	Breast cancer with sentinel lymph node (SLN) metastasis
Adjuvant! Online	Breast cancer patients in Surveillance, Epidemiology, and End-Results data	Age, menopausal status, Comorbidity, ER status, tumor size, positive nodes	Breast cancer specific mortality rates at the 10-year

Table S2: Difference in the demographic and clinical factors between the subjects receiving chemotherapy and without in total population.

Factors	Before matching				After PSM matching			
	Not receiving Chemotherapy	Receiving Chemotherapy	χ^2/Z	P-value	Not receiving Chemotherapy	Receiving Chemotherapy	χ^2/Z	P-value
Age			34.28	<0.0001			0.20	0.66
≤50 years	328(38.2)	2278(49.0)			328(38.2)	337(39.2)		
>50 years	531(61.8)	2367(51.0)			531(61.8)	522(60.8)		
Diameter			8.75	0.003			0.28	0.60
≤2 cm	418(48.7)	2007(43.2)			418(48.7)	429(49.9)		
>2cm	441(51.3)	2638(56.8)			441(51.3)	430(50.1)		
Histological differentiation			1.84	0.066			0.31	0.76
Well differentiated	97(11.3)	360(7.8)			97(11.3)	75(8.7)		
Moderately differentiated	610(71.0)	3457(74.4)			610(71.0)	646(75.2)		
Poor differentiated	152(17.7)	828(17.8)			152(17.7)	138(16.1)		
Lymph node metastasis			50.50	<0.0001			0.094	0.76
N0	567(66.0)	2456(52.9)			567(66.0)	573(66.7)		
N+	292(34.0)	2189(47.1)			292(34.0)	286(33.3)		
ER			3.31	0.07			1.88	0.17
Negative	243(28.3)	1459(31.4)			243(28.3)	269(31.3)		
Positive	616(71.7)	3186(68.6)			616(71.7)	590(68.7)		
PR			0.83	0.36			1.13	0.29
Negative	290(33.8)	1643(35.4)			290(33.8)	311(36.2)		
Positive	569(66.2)	3002(64.6)			569(66.2)	548(63.8)		
HER-2			1.64	0.20			0.114	0.74
Negative	654(76.1)	3440(74.1)			654(76.1)	648(75.4)		
Positive	205(23.9)	1205(25.9)			205(23.9)	211(24.6)		
Endocrine therapy			24.18	<0.0001			0.298	0.59
No	685(79.7)	3327(71.6)			685(79.7)	694(80.8)		
Yes	174(20.3)	1318(28.4)			174(20.3)	165(19.2)		
Radiotherapy			119.19	<0.0001			0.023	0.88
No	836(97.3)	3851(82.9)			836(97.3)	837(97.4)		
Yes	23(15.6)	794(17.1)			23(2.7)	22(2.6)		

Abbreviation: ER=estrogen receptor; PR=Progesterone receptor; HER-2=human epidermal growth factor receptor-2, PSM= propensity score matching.

Table S3: Difference in the demographic and clinical factors between the subjects receiving chemotherapy and without in low risk population.

Factors	Before matching				After PSM matching			
	Not receiving Chemotherapy	Receiving Chemotherapy	χ^2/Z	*P*-value	Not receiving Chemotherapy	Receiving Chemotherapy	χ^2/Z	*P*-value
Age			5.12	0.024			0.028	0.87
≤50 years	201(64.8)	1138(71.3)			201(64.8)	203(65.5)		
>50 years	109(35.2)	459(28.7)			109(35.2)	107(34.5)		
Diameter			0.016	0.90			0.008	0.93
≤2 cm	216(69.7)	1107(69.3)			216(69.7)	217(70.0)		
>2cm	94(30.3)	490(30.7)			94(30.3)	93(30.0)		
Histological differentiation			1.97	0.049			0.194	0.85
Well differentiated	73(23.5)	281(17.6)			73(23.5)	73(23.5)		
Moderately differentiated	209(67.4)	1169(73.2)			209(67.4)	212(68.4)		
Poor differentiated	28(9.0)	147(9.2)			28(9.0)	25(8.1)		
Lymph node metastasis			6.48	0.011			0.186	0.67
N0	285(91.9)	1385(86.7)			285(91.9)	282(91.0)		
N+	25(8.1)	212(13.3)			25(8.1)	28(9.0)		
ER			0.135	0.71			0.207	0.65
Negative	25(8.1)	139(8.7)			25(8.1)	22(7.1)		
Positive	285(91.9)	1458(91.3)			285(91.9)	288(92.9)		
PR			0.316	0.57			1.288	0.26
Negative	40(12.9)	188(11.8)			40(12.9)	31(10.0)		
Positive	270(87.1)	1409(88.3)			270(87.1)	279(90.0)		
HER-2			1.25	0.26			0.444	0.51
Negative	259(83.5)	1291(80.8)			259(83.5)	265(85.5)		
Positive	51(16.5)	306(19.2)			51(16.5)	45(14.5)		
Endocrine therapy			15.62	<0.001			0.077	0.78
No	233(75.2)	1014(63.5)			233(75.3)	230(74.2)		
Yes	77(24.8)	583(36.5)			77(24.8)	80(25.8)		
Radiotherapy			12.55	<0.001			0.113	0.74
No	305(98.4)	1488(93.2)			305(98.4)	306(98.7)		
Yes	5(1.6)	109(6.8)			5(1.6)	4(1.3)		

Abbreviation: ER=estrogen receptor; PR=Progesterone receptor; HER-2=human epidermal growth factor receptor-2, PSM= propensity score matching.

Table S4: Difference in the demographic and clinical factors between the subjects receiving chemotherapy and without in mediate risk population.

Factors	Before matching				After PSM matching			
	Not receiving Chemotherapy	Receiving Chemotherapy	χ^2/Z	*P*-value	Not receiving Chemotherapy	Receiving Chemotherapy	χ^2/Z	*P*-value
Age			19.06	<0.001			0.009	0.92
≤50 years	86(32.3)	702(46.8)			86(35.2)	85(34.8)		
>50 years	180(67.7)	799(53.2)			158(64.8)	159(65.2)		
Diameter			6.14	0.013			0.993	0.32
≤2 cm	135(50.8)	639(42.6)			113(46.3)	124(50.8)		
>2cm	131(49.2)	862(57.4)			131(53.7)	120(49.2)		
Histological differentiation			0.801	0.42			0.264	0.79
Well differentiated	19(7.1)	64(4.3)			19(7.8)	8(3.3)		
Moderately differentiated	198(74.4)	1162(77.4)			179(73.4)	197(80.7)		
Poor differentiated	49(18.4)	275(18.3)			46(18.8)	39(16.0)		
Lymph node metastasis			24.94	<0.001			0.329	0.57
N0	186(69.9)	802(53.4)			164(67.2)	158(64.8)		
N+	80(30.1)	699(46.6)			80(32.8)	86(35.2)		
ER			2.01	0.16			0.01	0.92
Negative	76(28.6)	495(33.0)			76(31.1)	77(31.6)		
Positive	190(71.4)	1006(67.0)			168(68.9)	167(68.4)		
PR			0.658	0.42			0.076	0.78
Negative	99(37.2)	520(34.6)			98(40.2)	101(41.4)		
Positive	167(62.8)	981(65.4)			146(59.8)	143(58.6)		
HER-2			0.271	0.60			0.263	0.61
Negative	195(73.3)	1123(74.8)			177(72.5)	182(74.6)		
Positive	71(26.7)	378(25.2)			67(27.5)	62(25.4)		
Endocrine therapy			8.60	0.003			0.014	0.91
No	211(79.3)	1059(70.6)			202(82.8)	201(82.4)		
Yes	55(20.7)	442(29.4)			42(17.2)	43(17.6)		
Radiotherapy			36.43	<0.001			0.069	0.79
No	258(97.0)	1239(82.5)			236(96.7)	237(97.1)		
Yes	8(3.0)	262(17.5)			8(3.3)	7(2.9)		

Abbreviation: ER=estrogen receptor; PR=Progesterone receptor; HER-2=human epidermal growth factor receptor-2, PSM= propensity score matching.

Table S5: Difference in the demographic and clinical factors between the subjects receiving chemotherapy and in high risk population.

Factors	Before matching				After PSM matching			
	Not receiving Chemotherapy	Receiving Chemotherapy	χ^2/Z	*P*-value	Not receiving Chemotherapy	Receiving Chemotherapy	χ^2/Z	*P*-value
Age			23.66	<0.001			0.125	0.72
≤50 years	41(14.5)	438(28.3)			41(15.1)	44(16.2)		
>50 years	242(85.5)	1109(71.7)			231(84.9)	228(83.8)		
Diameter			7.53	0.006			0.806	0.37
≤2 cm	67(23.7)	261(16.9)			62(22.8)	71(26.1)		
>2cm	216(76.3)	1286(83.1)			210(77.2)	201(73.9)		
Histological differentiation			0.115	0.91			0.117	0.91
Well differentiated	5(1.8)	15(1.0)			4(1.5)	7(2.5)		
Moderately differentiated	203(71.7)	1126(72.8)			197(72.4)	193(71.0)		
Poor differentiated	75(26.5)	406(26.2)			71(26.1)	72(26.5)		
Lymph node metastasis			40.96	<0.001			0.034	0.85
N0	96(33.9)	269(17.4)			88(32.4)	86(31.6)		
N+	187(66.1)	1278(82.6)			184(67.6)	186(68.4)		
ER			0.954	0.33			0.265	0.61
Negative	142(50.2)	825(53.3)			135(49.6)	141(51.8)		
Positive	141(49.8)	722(46.7)			137(50.4)	131(48.2)		
PR			4.97	0.026			0.119	0.73
Negative	151(53.4)	935(60.4)			148(54.4)	152(55.9)		
Positive	132(46.6)	612(39.6)			124(45.6)	120(44.1)		
HER-2			0.003	0.96			0.667	0.41
Negative	190(67.1)	1036(67.0)			185(68.0)	176(64.7)		
Positive	93(32.9)	511(33.0)			87(32.0)	96(35.3)		
Endocrine therapy			2.688	0.10			0.136	0.71
No	241(85.2)	1254(81.1)			232(85.3)	235(86.4)		
Yes	42(14.8)	293(18.9)			40(14.7)	37(13.6)		
Radiotherapy			75.09	<0.001			0.189	0.66
No	273(96.5)	1124(72.7)			262(96.3)	260(95.6)		
Yes	10(3.5)	423(27.3)			10(3.7)	12(4.4)		

Abbreviation: ER=estrogen receptor; PR=Progesterone receptor; HER-2=human epidermal growth factor receptor-2, PSM= propensity score matching.