

Supplementary Online Content

Bleicher RJ, Ruth K, Sigurdson ER, et al. Time to Surgery and Breast Cancer Survival in the United States. *JAMA Oncology*. Published online December 10, 2015. doi:10.1001/jamaoncol.2015.4508.

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This supplementary material has been provided by the authors to give readers additional information about their work.

eTable 1 (Online Only): Surgical Procedure Codes.

Procedure Category	CPT Procedure Codes	ICD-9 Procedure Codes
Lumpectomy	19120, 19125, 19126, 19160, 19301,	85.20, 85.21, 85.22, 85.23, 85.24, 85.25
Lumpectomy and lymphadenectomy	19162, 19302	
Mastectomy	19180, 19182, 19303, 19304	85.34, 85.36, 85.40, 85.41, 85.42
Mastectomy and lymphadenectomy	19200, 19220, 19240, 19305, 19306, 19307	84.43-85.44, 85.45, 85.46, 85.47, 85.48
Lymph node resection/lymphadenectomy	38500, 38525, 38530, 38740, 38745	40.11, 40.22, 40.23, 40.29, 40.3, 40.5, 40.50, 40.51
Sentinel lymphadenectomy	38790, 38792, 38900, 78195	40.19, 85.19, 92.16,

CPT = Current Procedural Terminology, ICD-9 = International Classification of Diseases, version 9.

eTable 2 (ONLINE ONLY). Missing covariate data.

Variable	SEER Medicare Missing (n)*	NCDB Missing (n)*
Age at diagnosis	0	0
Gender	0	0
Race/ethnicity	0	0
Charlson/Charlson-Deyo score	0	0
Elixhauser Score	0	N/A
Metropolitan setting	6	7,116
Region	0	0
Histology	0	0
Grade (including 13,573 unknown values)	0	0
Tumor Size	594	1,529
AJCC stage	0	0
Census Income (census tract median income)	1,259	6,283
Census Education (census tract % with <HS education)	1,259	6,287
Year of diagnosis	0	0
Married	0	0
Sequence of breast cancer	0	0
Number Nodes Positive	256	50
Number Nodes Examined	921	0
Surgery	0	0
Chemotherapy	0	0
Radiotherapy	0	0
*Not exclusive: some patients may have had more than one variable missing.		

eTable 3 (ONLINE ONLY). Hazard and subHazard ratios for Cox and Fine and Gray models.

Estimand	Estimates from SEER-Medicare	95% CI	P-value
Overall Survival HR	HR = 1.09	1.06 - 1.13	<0.001
Overall Survival HR, Stage 1	HR = 1.13	1.08 - 1.18	<0.001
Overall Survival HR, Stage 2	HR = 1.06	1.01 - 1.11	0.01
Overall Survival HR, Stage 3	HR = 1.06	0.97 - 1.16	0.17
Cause Specific Survival	sHR = 1.26	1.02 - 1.54	0.03
Cause Specific Survival, Stage 1	sHR = 1.84	1.10 - 3.07	0.02
Cause Specific Survival, Stage 2	sHR = 1.03	0.83 - 1.28	0.80
Cause Specific Survival, Stage 3	sHR = 1.04	0.82 - 1.33	0.74
Estimates from NCDB			
Estimand	Estimates from NCDB	95% CI	P-value
Overall Survival HR	HR = 1.10	1.07 - 1.13	<0.001
Overall Survival HR, Stage 1	HR = 1.16	1.12 - 1.21	<0.001
Overall Survival HR, Stage 2	HR = 1.09	1.05 - 1.13	<0.001
Overall Survival HR, Stage 3	HR = 1.01	0.96 - 1.07	0.64

eTable 4 (ONLINE ONLY). Top 30 causes of death for SEER-Medicare Database patients in descending order of frequency. Cell percentages represent column percentages of those who died.

Time from Diagnosis to Surgery (days)	≤30	31-60	61-90	91-120	121-180
	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
Breast Cancer	6,068 (24.4)	996 (24.3)	167 (24.6)	47 (23.3)	45 (31.5)
Diseases of the Heart	5,673 (22.8)	938 (22.9)	154 (22.7)	50 (24.8)	28 (19.6)
Other Cause of Death	2,586 (10.4)	442 (10.8)	83 (12.2)	19 (9.4)	12 (8.4)
Cerebrovascular Diseases	1,543 (6.2)	254 (6.2)	36 (5.3)	<11 **	<11 **
COPD* and Allied Conditions	1,041 (4.2)	189 (4.6)	36 (5.3)	12 (5.9)	<11 **
Lung and Bronchial Cancer	848 (3.4)	148 (3.6)	20 (2.9)	11 (5.4)	<11 **
Alzheimers Disease	785 (3.2)	109 (2.7)	16 (2.4)	<11 **	<11 **
Diabetes Mellitus	555 (2.2)	101 (2.5)	18 (2.7)	<11 **	<11 **
Pneumonia and Influenza	574 (2.3)	79 (1.9)	14 (2.1)	<11 **	<11 **
Miscellaneous Malignant Cancer	490 (2.0)	85 (2.1)	17 (2.5)	<11 **	<11 **
Unknown†	436 (1.8)	75 (1.8)	14 (2.1)	<11 **	<11 **
Accidents and Adverse Effects	402 (1.6)	62 (1.5)	<11 **	<11 **	<11 **
Colon (excluding Rectal) Cancer	354 (1.4)	49 (1.2)	<11 **	<11 **	<11 **
Nephritis, Nephrotic Syndrome, Nephrosis	341 (1.4)	53 (1.3)	<11 **	<11 **	<11 **
Pancreatic Cancer	293 (1.2)	52 (1.3)	<11 **	<11 **	<11 **
Septicemia	255 (1.0)	40 (1.0)	<11 **	<11 **	<11 **
Hypertension without Heart Disease	220 (0.9)	30 (0.7)	<11 **	<11 **	<11 **
Symptoms, Signs and Ill-Defined Conditions	213 (0.9)	30 (0.7)	<11 **	<11 **	<11 **
Ovarian Cancer	175 (0.7)	30 (0.7)	<11 **	<11 **	<11 **
Non-Hodgkin Lymphoma	160 (0.6)	19 (0.5)	<11 **	<11 **	<11 **
In situ, benign or neoplasm of unknown behavior	131 (0.5)	23 (0.6)	<11 **	<11 **	<11 **
Atherosclerosis	126 (0.5)	20 (0.5)	<11 **	<11 **	<11 **
Infectious/Parasitic Diseases, including HIV	115 (0.5)	21 (0.5)	<11 **	<11 **	<11 **
Chronic Liver Disease and Cirrhosis	112 (0.5)	17 (0.4)	<11 **	<11 **	<11 **
Aortic Aneurysm and Dissection	94 (0.4)	15 (0.4)	<11 **	<11 **	<11 **
Diseases of Arteries, Arterioles, Capillaries	95 (0.4)	15 (0.4)	<11 **	<11 **	<11 **
Acute Myeloid Leukemia	83 (0.3)	<11 **	<11 **	<11 **	<11 **
Urinary Bladder Cancer	66 (0.3)	13 (0.3)	<11 **	<11 **	<11 **
Gastric Cancer	68 (0.3)	13 (0.3)	<11 **	<11 **	<11 **
Uterine Cancer, NOS‡	64 (0.3)	13 (0.3)	<11 **	<11 **	<11 **

* COPD = Chronic obstructive pulmonary disease

† Death certificate not available or other cause of death

** Cells containing <11 individuals have been censored as per NCI SEER-Medicare requirements

‡ NOS = Not otherwise specified, excluding cancer of the uterine corpus.

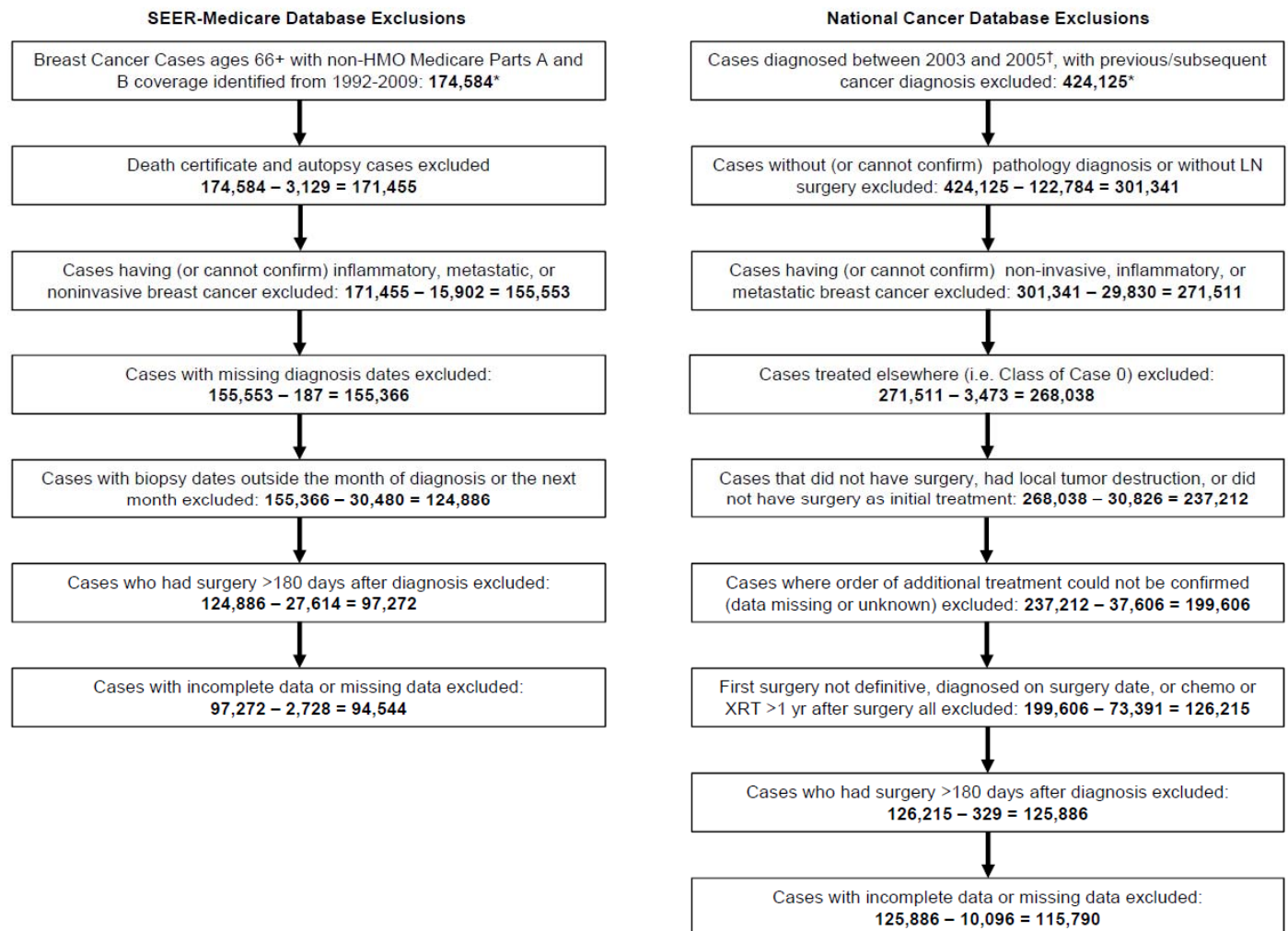
eTable 5 (ONLINE ONLY). NCDB variables included and adjusted for as part of the analysis, along with those listed in Table 2, by delay group, (Continuation of Table 2, listed here for space reasons).

Characteristic	Adjusted % (Unadjusted %)* unless otherwise specified				
	≤30 days	31-60 days	61-90 days	91-120 days	121-180 days
Total Patients	80,505	28,832	4,697	1,152	604
Region					
Northeast	5.6 (5.2)	5.6 (6.5)	5.5 (6.0)	7.1 (5.6)	5.5 (3.2)
Atlantic	13.3 (11.9)	13.5 (16.2)	14.2 (17.4)	13.7 (17.9)	13.9 (13.7)
Southeast	22.7 (21.9)	22.6 (24.1)	21.5 (27.1)	24.7 (30.0)	22.9 (28.5)
Great Lakes	19.1 (19.6)	19.0 (18.4)	19.5 (18.1)	15.7 (13.8)	21.6 (19.0)
South	6.6 (7.5)	6.6 (4.6)	6.7 (3.9)	6.3 (3.7)	9.3 (4.5)
Midwest	8.8 (10.4)	8.8 (5.6)	9.0 (4.0)	7.9 (3.7)	6.8 (3.2)
West	7.1 (7.7)	7.0 (5.8)	6.6 (5.3)	8.2 (6.3)	5.8 (7.6)
Mountain	4.4 (4.5)	4.5 (4.4)	4.5 (3.9)	3.8 (3.6)	3.3 (3.6)
Pacific	12.3 (11.4)	12.4 (14.4)	12.5 (14.3)	12.6 (15.5)	11.0 (16.7)
Median Household Income by ZIP code					
<\$30,000	11.6 (11.2)	11.6 (11.8)	11.7 (15.3)	11.5 (17.8)	13 (21.7)
\$30,000 - \$35,000	17.4 (17.6)	17.5 (16.9)	17.9 (17.2)	17.3 (17.8)	18.6 (19.9)
\$35,000 - \$45,999	28.3 (28.5)	28.1 (28.0)	28.2 (27.8)	28.7 (26.9)	26.3 (27.3)
\$46,000+	42.7 (42.8)	42.8 (43.3)	42.2 (39.6)	42.5 (37.5)	42 (31.1)
% of ZIP Code with < High School (12 Years) of Education					
29%+	14.3 (13.5)	14.3 (15.2)	14.8 (18.6)	14.7 (25.0)	14.6 (28.3)
20%-28.9%	21.2 (21.0)	21.4 (21.2)	21 (23.7)	19 (22.3)	22.2 (25.5)
14%-19.9%	23.4 (23.6)	23.2 (23.3)	23.8 (23.3)	26.3 (20.1)	23.3 (20.0)
<14%	41.0 (42.0)	41.0 (40.4)	40.4 (34.5)	39.9 (32.6)	39.9 (26.2)
Year of Diagnosis					
2003	31.5 (32.1)	31.5 (30.2)	32.6 (30.0)	33.0 (30.6)	31.5 (30.5)
2004	33.3 (33.4)	33.0 (33.2)	32.6 (32.6)	30.6 (30.9)	33.5 (32.0)
2005	35.2 (34.5)	35.5 (36.6)	34.9 (37.4)	36.3 (38.5)	35.0 (37.6)
Facility/Cancer Program Type					
Community	13.6 (14.8)	13.8 (10.8)	14.3 (10.5)	13.7 (11.1)	13.5 (11.3)
Comprehensive Community	56.6 (58.3)	56.3 (53.8)	56.5 (49.1)	55.9 (46.9)	57.7 (47.4)
Academic/Research ^{§§}	28.3 (25.4)	28.3 (33.9)	27.6 (38.7)	29.6 (40.6)	27.1 (39.4)
Other Specified Types	1.5 (1.5)	1.5 (1.5)	1.6 (1.7)	0.8 (1.4)	1.7 (2.0)
Mean Distance To Facility in Miles					
	56.7 (57.6)	58.8 (55.3)	46.7 (55.1)	94.8 (32.6)	34.6 (75.9)
Analytic Case Type					
Initial diagnosis at facility	69.5 (71.5)	69.5 (65.9)	69.6 (62.1)	66.6 (58.7)	67.2 (60.8)
Initial diagnosis elsewhere	30.5 (28.5)	30.5 (34.1)	30.4 (37.9)	33.4 (41.3)	32.8 (39.2)

Totals may vary from 100% due to rounding.

[†]Region groupings: Northeast = CT, MA, ME, NJ, RI, VT; Atlantic = NJ, NY, PA; Southeast = DC, DE, FL, GA, MD, NC, SC, VA, WV; Great Lakes = IL, IN, MI, OH, WI; South = AL, KY, MS, TN; Midwest = IA, KS, MN, MO, ND, NE, SD; West = AR, LA, OK, TX; Mountain = AZ, CO, ID, MT, NM, NV, UT, WY; Pacific = AK, CA, HI, OR, WA.

^{§§}Includes NCI-designated comprehensive cancer centers

eFigure 1 (ONLINE ONLY). Flow diagram of exclusions for each cohort analyzed.

*Dataset patients beyond these included those not germane, such as those on disability or scattered patients in years not applicable to study.

†Per NCDB requirement limiting to these years to allow 5 years of follow up

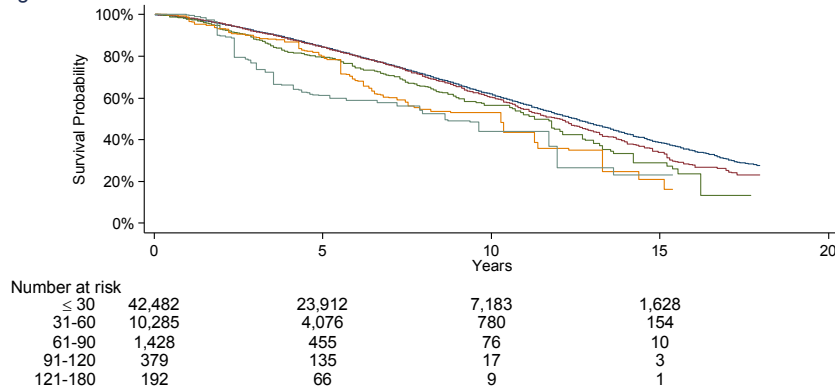
eFigure 2 (Online Only). Adjusted overall survival for SEER-Medicare Database patients for preoperative delay intervals of ≤ 30 , 31-60, 61-90, 91-120, and 121-180 days. Panels show (A) stage I, (B) stage II, and (C) Stage III disease.

A. HR 1.13, $p < 0.001$ 95% CI 1.08-1.18, interaction with Stage II, $p = 0.048$.

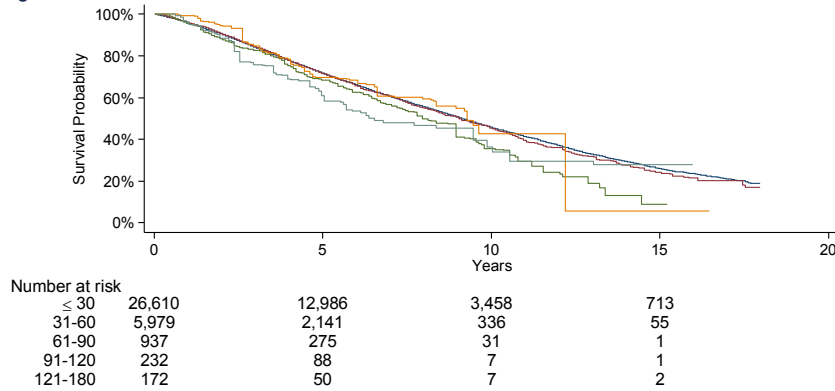
B. HR 1.06, $p = 0.010$ 95% CI 1.01-1.11, interaction with Stage III, $p = 0.95$.

C. HR 1.06 $p = 0.17$, 95% CI 0.97-1.16, interaction with Stage I, $p = 0.21$.

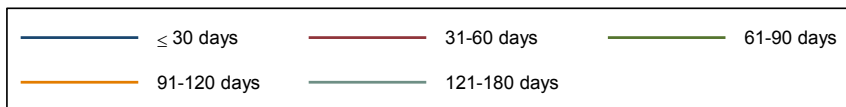
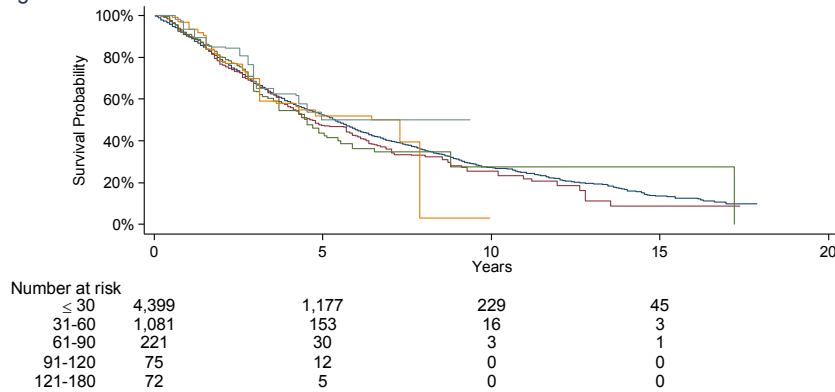
eFigure 2A



eFigure 2B



eFigure 2C



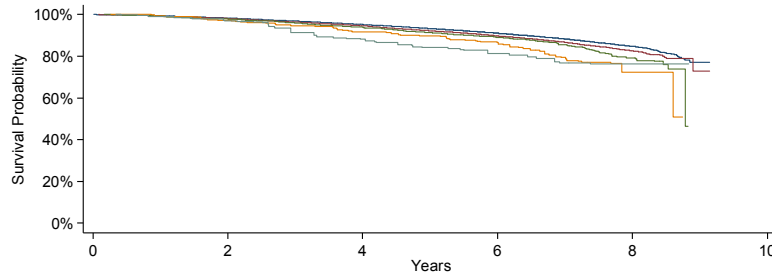
eFigure 3 (Online Only). Adjusted overall survival for National Cancer Database patients for preoperative delay intervals of ≤30, 31-60, 61-90, 91-120, and 121-180 days. Panels show (A) stage I, (B) stage II, and (C) Stage III disease.

A. HR 1.16 $p < 0.0001$, 95% CI 1.12-1.21, interaction with stage II, $p = 0.028$.

B. HR 1.09, $p < 0.001$, 95% CI 1.05-1.13, interaction with stage III, $p = 0.039$.

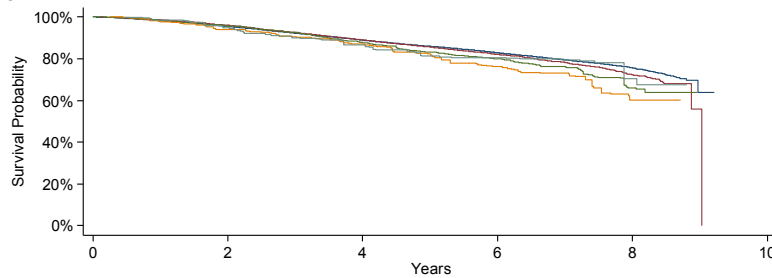
C. HR 1.01, $p = 0.640$, 95% CI 0.96-1.07, interaction with stage I $p < 0.001$.

eFigure 3A



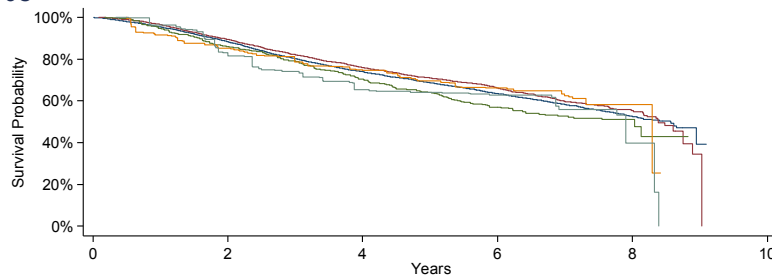
Number at risk	≤ 30	31-60	61-90	91-120	121-180
0	41,563	38,801	36,196	23,863	3,218
2	15,459	14,327	13,249	8,366	1,044
4	2,445	2,233	2,055	1,259	152
6	581	526	463	284	22
8	251	221	188	113	9

eFigure 3B



Number at risk	≤ 30	31-60	61-90	91-120	121-180
0	30,306	27,347	24,413	15,844	2,133
2	10,460	9,462	8,382	5,177	595
4	1,671	1,470	1,266	732	75
6	402	336	285	156	12
8	235	202	164	95	15

eFigure 3C



Number at risk	≤ 30	31-60	61-90	91-120	121-180
0	8,636	7,274	5,923	3,647	460
2	2,913	2,483	2,012	1,178	144
4	581	460	346	179	20
6	169	129	106	57	6
8	118	90	61	31	3

