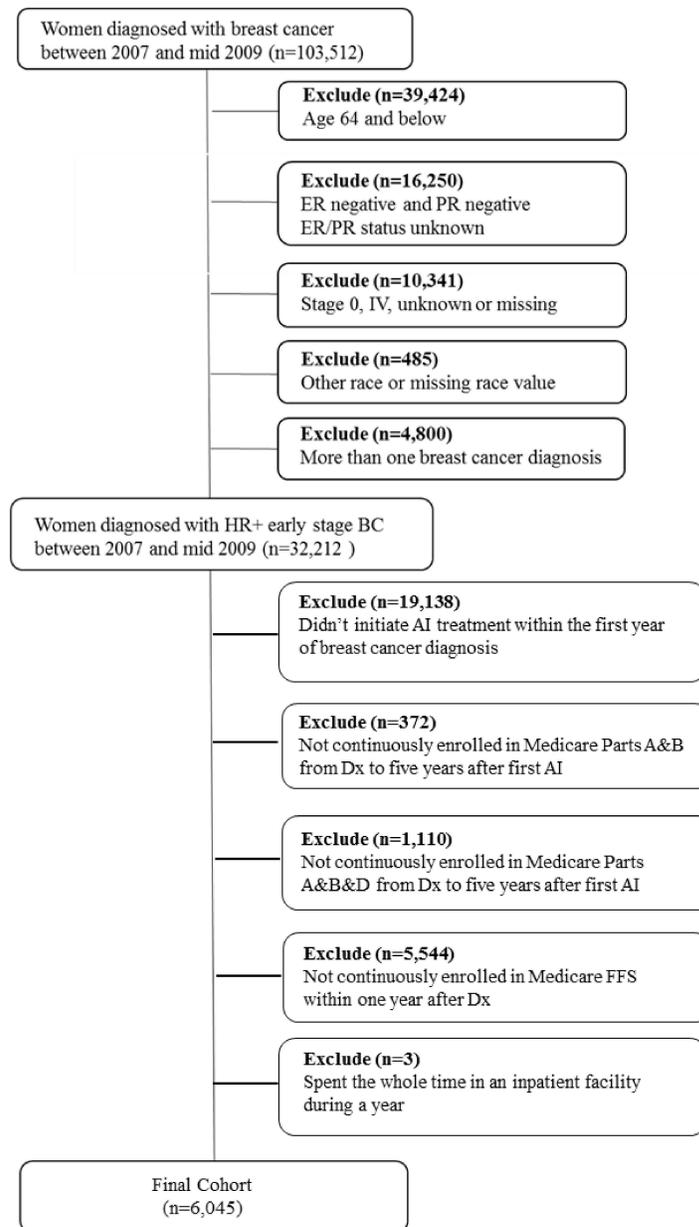


*Appendix A. Selection Criteria for Identifying Medicare Beneficiaries Diagnosed with Hormone Receptor-Positive Early Stage Breast Cancer from 2007 to Mid-2009*



*Appendix B. Descriptions of Variables*

<b>VARIABLE NAME</b>	<b>DEFINITION</b>
<b>DEPENDENT VARIABLES</b>	
<i>Healthcare utilization</i>	
Any hospitalization	A dummy variable equal to 1 if at least one hospitalization
Inpatient visits	A continuous variable of number of hospitalizations
Length of stay	A continuous variable of number of days in hospital
Any outpatient visits	A dummy variable equal to 1 if at least one outpatient visits
Outpatient visits	A continuous variable of number of outpatient visits
<i>Healthcare costs</i>	
Total healthcare costs	A continuous variable measures the sum of non-drug medical costs and prescription drug costs
Non-drug medical costs	A continuous variable measures the sum of inpatient and outpatient costs
Inpatient costs	A subgroup of total medical costs
Outpatient costs	A subgroup of total medical costs
Prescription drug costs	A continuous variable
<b>TREATMENT VARIABLES</b>	
Adherence continuous	A continuous variable of MPR %
Adherence dummy	A dummy equal to 1 if MPR $\geq 80\%$
<b>CONTROL VARIABLES</b>	
Race/Ethnicity	A dummy variable equal to 1 if White, non-Hispanic
Age continuous	A continuous variable, 65+ years old
Married	A dummy variable equal to 1 if married
Tumor Stage	A categorical variable where 1 Stage I 2 Stage II 3 Stage III
Initial Surgery/Radiation Treatment	A categorical variable where 1 No surgery 2 Surgery (breast-conserving surgery or mastectomy) + radiation 3 Surgery, no radiation

---

HCC Risk Score	A categorical variable where
(see detailed construction description on NCI	1 0
website: <a href="https://healthcaresdelivery.cancer.gov/seermedicare/considerations/comorbidity.html">https://healthcaresdelivery.cancer.gov/</a>	2 1
<a href="https://healthcaresdelivery.cancer.gov/seermedicare/considerations/comorbidity.html">seermedicare/considerations/comorbidity.html</a> )	3 2
	4 3+

---

*Appendix C. Association between Medication Possession Ratio and Healthcare Utilization and Costs among Medicare Beneficiaries with Breast Cancer over the Full Course of Treatment, controlling for covariates*

*C-1. No. of Hospitalization*

<b>Variables</b>	<b>Estimates</b>	<b>SE</b>	<b>P</b>	<b>95% CI</b>	
MPR	-0.083	0.013	***	-0.108	-0.058
Year					
2 vs 1	-0.132	0.018	***	-0.167	-0.096
3 vs 1	-0.108	0.019	***	-0.144	-0.071
4 vs 1	0.033	0.021	NS	-0.008	0.075
5 vs 1	0.066	0.022	**	0.022	0.109
HCC Score					
1 vs 0	0.114	0.014	***	0.088	0.141
2 vs 0	0.255	0.022	***	0.211	0.299
3+ vs 0	0.599	0.033	***	0.535	0.664
Married					
Yes vs No	-0.098	0.013	***	-0.123	-0.074
Treatment					
No surgery vs			***		
Surgery + radiation	0.077	0.013		0.052	0.102
Surgery, no radiation			***		
vs Surgery + radiation	0.304	0.056		0.194	0.414
Race					
Asian vs White	-0.182	0.023	***	-0.226	-0.138
Black vs White	0.023	0.025	NS	-0.026	0.073
Hispanic vs White	-0.046	0.024	NS	-0.094	0.001
Stage					
II vs I	0.059	0.013	***	0.033	0.090
III vs I	0.152	0.024	***	0.104	0.200
Age	0.010	0.001	***	0.008	0.011

*Note: \*statistically significant at P<0.05 level, \*\* at P<0.01 level, \*\*\* at P<0.001 level; NS stands for not significant*

## C-2. LOS

Variables	Estimates	SE	P	95% CI	
MPR	-0.701	0.309	*	-1.305	-0.096
Year					
2 vs 1	-1.403	0.328	***	-2.047	-0.759
3 vs 1	-0.882	0.370	*	-1.607	-0.157
4 vs 1	0.949	0.438	*	0.091	1.808
5 vs 1	0.724	0.383	NS	-0.026	1.475
HCC Score					
1 vs 0	1.490	0.247	***	1.006	1.974
2 vs 0	3.102	0.381	***	2.354	3.849
3+ vs 0	8.179	0.628	***	6.949	9.409
Married					
Yes vs No	-2.036	0.215	***	-2.458	-1.614
Treatment					
No surgery vs			***		
Surgery + radiation	1.322	0.237		0.858	1.787
Surgery, no radiation			***		
vs Surgery + radiation	4.842	1.198		2.494	7.189
Race					
Asian vs White	-2.255	0.390	***	-3.019	-1.491
Black vs White	0.840	0.567	NS	-0.271	1.951
Hispanic vs White	-0.851	0.424	*	-1.683	-0.020
Stage					
II vs I	1.070	0.246	***	0.588	1.552
III vs I	2.248	0.524	***	1.221	3.275
Age	0.190	0.020	***	0.151	0.229

Note: \*statistically significant at  $P < 0.05$  level, \*\* at  $P < 0.01$  level, \*\*\* at  $P < 0.001$  level; NS stands for not significant

*C-3. No. of Outpatient Visits*

<b>Variables</b>	<b>Estimates</b>	<b>SE</b>	<b>P</b>	<b>95% CI</b>	
MPR	-0.230	0.103	*	-0.431	-0.029
Year					
2 vs 1	-1.370	0.132	***	-1.628	-1.112
3 vs 1	-1.620	0.132	***	-1.878	-1.361
4 vs 1	-1.844	0.132	***	-2.103	-1.585
5 vs 1	-1.752	0.137	***	-2.020	-1.485
HCC Score					
1 vs 0	0.757	0.093	***	0.575	0.940
2 vs 0	1.651	0.143	***	1.371	1.930
3+ vs 0	3.277	0.187	***	2.911	3.643
Married					
Yes vs No	-0.246	0.082	**	-0.406	-0.085
Treatment					
No surgery vs					
Surgery + radiation	-0.463	0.082	***	-0.623	-0.303
Surgery, no radiation					
vs Surgery + radiation	-0.522	0.266	NS	-1.044	-0.001
Race					
Asian vs White	-1.212	0.166	***	-1.537	-0.886
Black vs White	1.080	0.195	***	0.697	1.463
Hispanic vs White	0.216	0.180	NS	-0.138	0.570
Stage					
II vs I	0.847	0.087	***	0.676	1.018
III vs I	1.276	0.157	***	0.968	1.583
Age	-0.059	0.006	***	-0.072	-0.046

Note: \*statistically significant at  $P < 0.05$  level, \*\* at  $P < 0.01$  level, \*\*\* at  $P < 0.001$  level; NS stands for not significant

## C-4. No. of Physician Office Visits

Variables	Estimates	SE	P	95% CI	
MPR	-1.233	0.257	***	-1.736	-0.729
Year					
2 vs 1	-4.469	0.327	***	-5.110	-3.829
3 vs 1	-5.454	0.326	***	-6.093	-4.815
4 vs 1	-5.773	0.329	***	-6.419	-5.128
5 vs 1	-6.128	0.337	***	-6.788	-5.468
HCC Score					
1 vs 0	3.756	0.235	***	3.294	4.217
2 vs 0	7.022	0.360	***	6.316	7.728
3+ vs 0	14.854	0.487	***	13.900	15.808
Married					
Yes vs No	0.040	0.207	NS	-0.366	0.446
Treatment					
No surgery vs					
Surgery + radiation	-1.893	0.204	***	-2.293	-1.493
Surgery, no radiation					
vs Surgery + radiation	-1.230	0.680	NS	-2.563	0.104
Race					
Asian vs White	-2.075	0.448	***	-2.954	-1.196
Black vs White	-1.614	0.408	***	-2.415	-0.814
Hispanic vs White	-0.506	0.431	NS	-1.352	0.339
Stage					
II vs I	0.654	0.215	**	0.232	1.076
III vs I	0.334	0.356	NS	-0.364	1.032
Age	0.014	0.016	NS	-0.018	0.046

Note: \*statistically significant at  $P < 0.05$  level, \*\* at  $P < 0.01$  level, \*\*\* at  $P < 0.001$  level; NS stands for not significant

## C-5. Total Healthcare Costs

Variables	Estimates	SE	P	95% CI	
MPR	579	358	NS	-123	1,282
Year					
2 vs 1	-6,919	365	***	-7,633	-6,205
3 vs 1	-7,389	400	***	-8,173	-6,605
4 vs 1	-7,127	428	***	-7,967	-6,288
5 vs 1	-9,523	432	***	-10,369	-8,676
HCC Score					
1 vs 0	3,668	296	***	3,087	4,249
2 vs 0	7,373	461	***	6,469	8,277
3+ vs 0	17,036	748	***	15,571	18,501
Married					
Yes vs No	-1,637	264	***	-2,155	-1,120
Treatment					
No surgery vs					
Surgery + radiation	276	270	NS	-253	804
Surgery, no radiation					
vs Surgery + radiation	2,108	906	*	333	3,884
Race					
Asian vs White	-200	594	NS	-1,364	965
Black vs White	1,837	636	**	592	3,083
Hispanic vs White	1,588	592	**	427	2,749
Stage					
II vs I	1,832	280	***	1,283	2,380
III vs I	3,687	500	***	2,707	4,667
Age	26	21	NS	-15	68

Note: \*statistically significant at  $P < 0.05$  level, \*\* at  $P < 0.01$  level, \*\*\* at  $P < 0.001$  level; NS stands for not significant

*C-6. Total Non-drug Medical Costs*

<b>Variables</b>	<b>Estimates</b>	<b>SE</b>	<b>P</b>	<b>95% CI</b>	
MPR	-2,716	322	***	-3,347	-2,086
Year					
2 vs 1	-6,404	362	***	-7,114	-5,695
3 vs 1	-5,964	391	***	-6,731	-5,196
4 vs 1	-4,681	420	***	-5,504	-3,858
5 vs 1	-6,363	418	***	-7,183	-5,543
HCC Score					
1 vs 0	2,298	274	***	1,761	2,836
2 vs 0	5,107	432	***	4,260	5,955
3+ vs 0	13,098	708	***	11,711	14,485
Married					
Yes vs No	-1,115	245	***	-1,596	-634
Treatment					
No surgery vs					
Surgery + radiation	-216	249	NS	-703	272
Surgery, no radiation					
vs Surgery + radiation	2,306	869	**	604	4,009
Race					
Asian vs White	-1,633	553	**	-2,717	-549
Black vs White	1,277	591	*	119	2,435
Hispanic vs White	1,328	568	*	215	2,441
Stage					
II vs I	1,489	258	***	984	1,995
III vs I	3,670	477	***	2,736	4,603
Age	51	20	*	12	89

Note: \*statistically significant at  $P < 0.05$  level, \*\* at  $P < 0.01$  level, \*\*\* at  $P < 0.001$  level; NS stands for not significant

## C-7. Medication Costs

Variables	Estimates	SE	P	95% CI	
MPR	3,637	101	***	3,440	3,834
Year					
2 vs 1	-767	91	***	-946	-589
3 vs 1	-1,589	98	***	-1,782	-1,396
4 vs 1	-2,514	100	***	-2,711	-2,317
5 vs 1	-3,221	105	***	-3,427	-3,016
HCC Score					
1 vs 0	1,476	81	***	1,317	1,635
2 vs 0	2,428	128	***	2,178	2,678
3+ vs 0	4,270	184	***	3,909	4,631
Married					
Yes vs No	-505	68	***	-639	-371
Treatment					
No surgery vs					
Surgery + radiation	553	74	***	408	697
Surgery, no radiation					
vs Surgery + radiation	-109	214	NS	-528	310
Race					
Asian vs White	1,444	194	***	1,063	1,825
Black vs White	378	141	**	102	653
Hispanic vs White	286	124	*	44	528
Stage					
II vs I	209	73	**	65	353
III vs I	-84	117	NS	-314	145
Age	-28	5	***	-38	-18

Note: \*statistically significant at  $P < 0.05$  level, \*\* at  $P < 0.01$  level, \*\*\* at  $P < 0.001$  level; NS stands for not significant

*Appendix D. Association between Adherent and Nonadherent Breast Cancer Patients with Medicare Coverage and Healthcare Utilization and Costs over the Full Course of Treatment*

*D-1. No. of Hospitalization*

<b>Variables</b>	<b>Estimates</b>	<b>SE</b>	<b>P</b>	<b>95% CI</b>	
Adherent (Yes vs No)	-0.083	0.013	***	-0.108	-0.058
Year					
2 vs 1	-0.131	0.018	***	-0.166	-0.096
3 vs 1	-0.105	0.019	***	-0.142	-0.069
4 vs 1	0.034	0.021	NS	-0.007	0.075
5 vs 1	0.062	0.022	**	0.019	0.105
HCC Score					
1 vs 0	0.115	0.014	***	0.089	0.142
2 vs 0	0.256	0.023	***	0.212	0.301
3+ vs 0	0.583	0.033	***	0.518	0.649
Married					
Yes vs No	-0.096	0.013	***	-0.120	-0.071
Treatment					
No surgery vs			***		
Surgery + radiation	0.072	0.013		0.047	0.097
Surgery, no radiation			***		
vs Surgery + radiation	0.284	0.056		0.174	0.394
Race					
Asian vs White	-0.167	0.022	***	-0.211	-0.123
Black vs White	0.018	0.025	NS	-0.030	0.067
Hispanic vs White	-0.022	0.025	NS	-0.072	0.027
Stage					
II vs I	0.063	0.013	***	0.037	0.089
III vs I	0.133	0.024	***	0.087	0.180
Age	0.009	0.001	***	0.007	0.011

Note: \*statistically significant at  $P < 0.05$  level, \*\* at  $P < 0.01$  level, \*\*\* at  $P < 0.001$  level; NS stands for not significant

## D-2. LOS

Variables	Estimates	SE	P	95% CI	
Adherent (Yes vs No)	-0.607	0.215	**	-1.028	-0.187
Year					
2 vs 1	-1.378	0.294	***	-1.953	-0.803
3 vs 1	-0.841	0.316	**	-1.460	-0.221
4 vs 1	1.018	0.376	**	0.281	1.755
5 vs 1	0.751	0.362	*	0.042	1.460
HCC Score					
1 vs 0	1.495	0.214	***	1.076	1.914
2 vs 0	3.109	0.368	***	2.388	3.831
3+ vs 0	8.199	0.645	***	6.936	9.463
Married					
Yes vs No	-2.046	0.199	***	-2.436	-1.656
Treatment					
No surgery vs			***		
Surgery + radiation	1.331	0.211		0.917	1.746
Surgery, no radiation			***		
vs Surgery + radiation	4.816	1.135		2.591	7.040
Race					
Asian vs White	-2.255	0.329	***	-2.899	-1.611
Black vs White	0.848	0.495	NS	-0.122	1.818
Hispanic vs White	-0.846	0.369	*	-1.570	-0.123
Stage					
II vs I	1.067	0.228	***	0.621	1.514
III vs I	2.253	0.451	***	1.368	3.137
Age	0.191	0.019	***	0.154	0.227

Note: \*statistically significant at  $P < 0.05$  level, \*\* at  $P < 0.01$  level, \*\*\* at  $P < 0.001$  level; NS stands for not significant

*D-3. No. of Outpatient Visits*

<b>Variables</b>	<b>Estimates</b>	<b>SE</b>	<b>P</b>	<b>95% CI</b>	
Adherent (Yes vs No)	-0.141	0.080	NS	-0.298	0.015
Year					
2 vs 1	-1.351	0.130	***	-1.607	-1.096
3 vs 1	-1.599	0.130	***	-1.854	-1.343
4 vs 1	-1.825	0.130	***	-2.080	-1.570
5 vs 1	-1.733	0.135	***	-1.997	-1.469
HCC Score					
1 vs 0	0.756	0.093	***	0.573	0.939
2 vs 0	1.651	0.143	***	1.371	1.932
3+ vs 0	3.271	0.187	***	2.904	3.637
Married					
Yes vs No	-0.252	0.082	**	-0.413	-0.091
Treatment					
No surgery vs					
Surgery + radiation	-0.464	0.082	***	-0.624	-0.304
Surgery, no radiation					
vs Surgery + radiation	-0.538	0.265	*	-1.058	-0.018
Race					
Asian vs White	-1.176	0.166	***	-1.500	-0.851
Black vs White	1.079	0.195	***	0.696	1.462
Hispanic vs White	0.204	0.181	NS	-0.151	0.559
Stage					
II vs I	0.847	0.087	***	0.677	1.018
III vs I	1.277	0.157	***	0.969	1.584
Age	-0.059	0.006	***	-0.071	-0.046

Note: \*statistically significant at  $P < 0.05$  level, \*\* at  $P < 0.01$  level, \*\*\* at  $P < 0.001$  level; NS stands for not significant

*D-4. No. of Physician Office Visits*

<b>Variables</b>	<b>Estimates</b>	<b>SE</b>	<b>P</b>	<b>95% CI</b>	
Adherent (Yes vs No)	-1.116	0.200	***	-1.507	-0.724
Year					
2 vs 1	-4.432	0.325	***	-5.068	-3.795
3 vs 1	-5.382	0.324	***	-6.016	-4.748
4 vs 1	-5.679	0.327	***	-6.319	-5.039
5 vs 1	-6.090	0.333	***	-6.743	-5.436
HCC Score					
1 vs 0	3.762	0.235	***	3.301	4.224
2 vs 0	7.038	0.360	***	6.332	7.745
3+ vs 0	14.873	0.487	***	13.918	15.827
Married					
Yes vs No	0.024	0.207	NS	-0.383	0.430
Treatment					
No surgery vs					
Surgery + radiation	-1.884	0.204	***	-2.285	-1.484
Surgery, no radiation					
vs Surgery + radiation	-1.258	0.679	NS	-2.589	0.074
Race					
Asian vs White	-2.069	0.448	***	-2.947	-1.190
Black vs White	-1.605	0.408	***	-2.405	-0.805
Hispanic vs White	-0.488	0.432	NS	-1.334	0.358
Stage					
II vs I	0.651	0.215	**	0.229	1.072
III vs I	0.345	0.356	NS	-0.354	1.044
Age	0.015	0.016	NS	-0.017	0.046

*D-5. Total Healthcare Costs*

<b>Variables</b>	<b>Estimates</b>	<b>SE</b>	<b>P</b>	<b>95% CI</b>	
Adherent (Yes vs No)	146	263	NS	-369	661
<b>Year</b>					
2 vs 1	-7,009	363	***	-7,720	-6,298
3 vs 1	-7,494	397	***	-8,271	-6,717
4 vs 1	-7,245	423	***	-8,074	-6,416
5 vs 1	-9,660	428	***	-10,499	-8,821
<b>HCC Score</b>					
1 vs 0	3,672	296	***	3,091	4,253
2 vs 0	7,388	462	***	6,482	8,293
3+ vs 0	17,052	747	***	15,588	18,517
<b>Married</b>					
Yes vs No	-1,643	264	***	-2,160	-1,126
<b>Treatment</b>					
No surgery vs Surgery + radiation	269	269	NS	-259	797
Surgery, no radiation vs Surgery + radiation	2,089	904	*	318	3,861
<b>Race</b>					
Asian vs White	-158	597	NS	-1,329	1,013
Black vs White	1,867	635	**	621	3,112
Hispanic vs White	1,600	591	**	441	2,759
<b>Stage</b>					
II vs I	1,846	279	***	1,298	2,394
III vs I	3,677	499	***	2,700	4,655
Age	25	21	NS	-16	66

Note: \*statistically significant at  $P < 0.05$  level, \*\* at  $P < 0.01$  level, \*\*\* at  $P < 0.001$  level; NS stands for not significant

*D-6. Total Non-drug Medical Costs*

<b>Variables</b>	<b>Estimates</b>	<b>SE</b>	<b>P</b>	<b>95% CI</b>	
Adherent (Yes vs No)	-2,243	250	***	-2,733	-1,753
Year					
2 vs 1	-6,257	355	***	-6,953	-5,562
3 vs 1	-5,760	383	***	-6,511	-5,010
4 vs 1	-4,448	410	***	-5,252	-3,643
5 vs 1	-6,171	413	***	-6,981	-5,360
HCC Score					
1 vs 0	2,302	273	***	1,768	2,837
2 vs 0	5,129	432	***	4,283	5,976
3+ vs 0	13,102	707	***	11,717	14,488
Married					
Yes vs No	-1,128	245	***	-1,608	-647
Treatment					
No surgery vs					
Surgery + radiation	-207	248	NS	-693	279
Surgery, no radiation					
vs Surgery + radiation	2,232	865	*	536	3,928
Race					
Asian vs White	-1,689	537	**	-2,741	-637
Black vs White	1,308	590	*	151	2,465
Hispanic vs White	1,350	569	*	235	2,466
Stage					
II vs I	1,461	255	***	960	1,961
III vs I	3,724	481	***	2,781	4,666
Age	53	20	**	15	91

Note: \*statistically significant at  $P < 0.05$  level, \*\* at  $P < 0.01$  level, \*\*\* at  $P < 0.001$  level; NS stands for not significant

*D-7. Medication Costs*

<b>Variables</b>	<b>Estimates</b>	<b>SE</b>	<b>P</b>	<b>95% CI</b>	
Adherent (Yes vs No)	2,302	63	***	2,179	2,426
Year					
2 vs 1	-960	88	***	-1,133	-786
3 vs 1	-1,900	93	***	-2,082	-1,718
4 vs 1	-2,909	94	***	-3,093	-2,724
5 vs 1	-3,592	97	***	-3,783	-3,402
HCC Score					
1 vs 0	1,413	80	***	1,257	1,569
2 vs 0	2,376	127	***	2,128	2,624
3+ vs 0	4,211	192	***	3,835	4,588
Married					
Yes vs No	-477	69	***	-612	-342
Treatment					
No surgery vs					
Surgery + radiation	502	73	***	359	646
Surgery, no radiation					
vs Surgery + radiation	-100	206	NS	-503	303
Race					
Asian vs White	1,514	190	***	1,142	1,886
Black vs White	430	140	**	156	704
Hispanic vs White	299	124	*	57	541
Stage					
II vs I	304	77	***	154	454
III vs I	-64	112	NS	-283	155
Age	-32	5	***	-41	-22

Note: \*statistically significant at  $P < 0.05$  level, \*\* at  $P < 0.01$  level, \*\*\* at  $P < 0.001$  level; NS stands for not significant