

Supplementary Methods

From the Medicaid claims database in Missouri, we identified 22,500 women with claims for breast cancer from 2006 to 2016. Of these patients, 77% (n=17,246) matched a tumor record in the Missouri Cancer Registry database. Among the matching cases (n=17,246), 56.2% (n=9,693) were women with a reportable breast (invasive or in situ) tumor diagnosed between 2006 and 2016, and the remaining (n=7,553) were patients with a reportable tumor who were not eligible for the study due to having non-breast tumors or being diagnosed prior to 2006. Among 9,693 women with the linked Missouri Cancer Registry and Medicaid claims data available, 4,583 women were diagnosed with breast cancer at the ages of 18-65 years between January 1, 2007 and December 31, 2015 and were included in the current study.

Supplementary Tables

Supplementary Table 1. Unadjusted odds ratios of late-stage diagnosis and treatment delays in women with breast cancer enrolled in Medicaid before diagnosis compared to those peri-diagnosis, Missouri 2007 to 2015

Enrollment in Medicaid	Late-stage diagnosis ^a			Treatment delays ^b		
	Late-stage diagnosis, %	OR	95% CI	Treatment delays, %	OR	95% CI
>1 year before diagnosis	18.3	0.55*	0.47-0.65	16.2	0.91	0.76-1.08
≤1 year before diagnosis and later	28.9	1.00		17.5	1.00	
>90 days before diagnosis	21.2	0.65*	0.56-0.74	16.8	0.96	0.82-1.13
≤90 days before diagnosis and later	29.5	1.00		17.4	1.00	
>30 days before diagnosis	22.7	0.70*	0.61-0.80	16.5	0.91	0.78-1.06
≤30 days before diagnosis and later	29.6	1.00		17.9	1.00	

* $p < 0.05$

^a Included stages III-IV

^b Treatment was considered delayed if definitive surgery, radiation therapy, chemotherapy, and endocrine therapy began >60 days after diagnosis.

Supplementary Table 2. Multivariable models of late-stage diagnosis and treatment delay in women with breast cancer enrolled in Medicaid >30 days before diagnosis compared to those enrolled ≤30 days before diagnosis, Missouri 2007 to 2015

	Late-stage diagnosis		Treatment delays	
	OR	95% CI	OR	95% CI
Enrollment timing				
Enrolled ≤30 days before diagnosis	1.00		1.00	
Enrolled >30 days before diagnosis	0.69*	0.60-0.79	0.93	0.80-1.10
Age	0.99*	0.98-.999	1.00	1.00-1.01
Race and ethnicity, %				
Non-Hispanic White	1.00		1.00	
Non-Hispanic Black	1.38*	1.12-1.72	1.24	0.97-1.58
Other or unknown	0.93	0.55-1.51	1.12	0.62-1.90
Marital status, %				
Married	1.00		1.00	
Unmarried	0.96	0.82-1.11	0.99	0.83-1.19
Unknown	0.71	0.40-1.20	1.19	0.67-2.03
% Population under the federal poverty line^a, %				
Quartile 1 (<7.43)	1.00		1.00	
Quartile 2 (7.43-<13.24)	0.83	0.63-1.11	1.02	0.73-1.43
Quartile 3 (13.24-<21.10)	0.78	0.57-1.07	0.97	0.66-1.43
Quartile 4 (≥21.10)	0.84	0.58-1.24	0.91	0.58-1.44
% Population without high school diploma^a, %				
Quartile 1 (<2.16)	1.00		1.00	
Quartile 2 (2.16-<4.21)	1.10	0.86-1.41	1.00	0.76-1.33
Quartile 3 (4.21-<7.08)	1.14	0.88-1.48	0.88	0.65-1.19
Quartile 4 (≥7.08)	1.04	0.79-1.37	0.94	0.69-1.30
% Unemployed^a, %				
Quartile 1 (<4.18)	1.00		1.00	
Quartile 2 (4.18-<6.20)	1.16	0.91-1.48	0.80	0.60-1.08
Quartile 3 (6.20-<9.68)	1.19	0.93-1.52	0.93	0.70-1.24
Quartile 4 (≥9.68)	1.04	0.79-1.38	0.94	0.69-1.29
% Living in renter-occupied housing units^a, %				

Quartile 1 (<17.42)	1.00		1.00	
Quartile 2 (17.42-<27.46)	1.14	0.90-1.45	0.75*	0.56-0.997
Quartile 3 (27.46-<43.05)	1.14	0.88-1.49	0.75	0.55-1.03
Quartile 4 (≥43.05)	1.10	0.80-1.52	0.91	0.63-1.32
% Single-parent households with children ^a , %				
Quartile 1 (<20.33)	1.00		1.00	
Quartile 2 (20.33-<30.84)	0.98	0.77-1.24	1.18	0.88-1.59
Quartile 3 (30.84-<46.67)	0.93	0.72-1.21	1.12	0.81-1.55
Quartile 4 (≥46.67)	0.81	0.59-1.10	1.11	0.76-1.62
% Population with no car ^a , %				
Quartile 1 (<2.86)	1.00		1.00	
Quartile 2 (2.86-<5.47)	1.01	0.79-1.28	1.02	0.76-1.37
Quartile 3 (5.47-<10.44)	0.94	0.73-1.22	1.16	0.85-1.58
Quartile 4 (≥10.44)	1.06	0.77-1.45	0.78	0.53-1.14
% Population African American ^a , %				
Quartile 1 (<0.38)	1.00		1.00	
Quartile 2 (0.38-<2.64)	1.22	0.99-1.52	1.21	0.92-1.59
Quartile 3 (2.64-<11.40)	1.09	0.86-1.40	1.35*	1.00-1.82
Quartile 4 (≥11.40)	0.99	0.73-1.33	1.66*	1.17-2.36
% Population ≥65 years old ^a , %				
Quartile 1 (<9.67)	1.00		1.00	
Quartile 2 (9.67-<13.23)	0.84	0.69-1.03	1.04	0.82-1.30
Quartile 3 (13.23-<17.20)	0.90	0.73-1.11	0.98	0.77-1.25
Quartile 4 (≥17.20)	0.94	0.76-1.18	0.91	0.70-1.18
Median household income ^a , %				
Quartile 1 (<\$39911)	1.00		1.00	
Quartile 2 (\$39911-<\$51258)	1.05	0.83-1.32	1.09	0.83-1.42
Quartile 3 (\$51258-<\$66283)	1.05	0.77-1.41	0.79	0.55-1.13
Quartile 4 (≥\$66283)	0.95	0.61-1.47	1.09	0.65-1.82
Median home value ^a , %				
Quartile 1 (<\$82500)	1.00		1.00	
Quartile 2 (\$82500-<\$113600)	0.94	0.77-1.14	0.99	0.79-1.25
Quartile 3 (\$113600-<\$157000)	0.84	0.65-1.07	0.88	0.65-1.17

Quartile 4 (\geq \$157000)	0.72	0.51-1.01	0.77	0.52-1.14
Cancer stage, %				
0	—	—	1.00	
I	—	—	1.12	0.82-1.55
II	—	—	1.29	0.95-1.76
III	—	—	1.69*	1.20-2.39
IV	—	—	2.06*	1.45-2.93
Unknown	—	—	0.98	0.37-2.25
Tumor size, %				
\leq 20 mm	—	—	1.00	
21-50 mm	—	—	1.09	0.86-1.40
>50 mm	—	—	1.23	0.91-1.67
Unknown	—	—	1.55*	1.18-2.03
Tumor grade, %				
Well differentiation	—	—	1.00	
Intermediate differentiation	—	—	1.08	0.84-1.40
Poor differentiation	—	—	0.92	0.70-1.20
Unknown	—	—	1.18	0.81-1.71
Tumor subtype, %				
ER+ or PR+	—	—	1.00	
ER- and PR-	—	—	1.10	0.90-1.35
Unknown	—	—	2.05*	1.38-3.01

Abbreviations: SD, standard deviation; ER, estrogen receptor; PR, progesterone receptor.

^a Characteristics of census tract where patient was living at cancer diagnosis. Overall, census tract code was missing for 1.7% of patients, including 1.9% of patients enrolled before diagnosis and \leq 1.4% of patients enrolled after diagnosis.

Supplementary Table 3. Multivariable-adjusted hazards ratios of breast cancer-specific mortality in women with breast cancer enrolled in Medicaid >30 days before diagnosis compared to those enrolled ≤30 days before diagnosis, Missouri 2007 to 2015

	Model 1 ^a		Model 2 ^b		Model 3 ^c	
	OR	95% CI	OR	95% CI	OR	95% CI
Enrollment timing						
≤30 days pre-diagnosis	1.00		1.00		1.00	
>30 days pre-diagnosis	0.98	0.83-1.14	1.35*	1.15-1.58	1.33*	1.13-1.56
Age	1.00	0.99-1.01	1.01	1.00-1.01	1.00	0.99-1.01
Race and ethnicity						
Non-Hispanic White	1.00		1.00		1.00	
Non-Hispanic Black	1.33	1.04-1.70	1.10	0.85-1.41	1.15	0.89-1.48
Other or unknown	0.66	0.34-1.29	0.46*	0.23-0.90	0.46*	0.24-0.91
Marital status						
Married	1.00		1.00		1.00	
Unmarried	1.12	0.94-1.34	1.21*	1.01-1.44	1.19	0.99-1.42
Unknown	1.17	0.64-2.16	1.28	0.68-2.42	1.55	0.83-2.91
% Population under the federal poverty line ^d						
Quartile 1 (<7.43)	1.00		1.00		1.00	
Quartile 2 (7.43-<13.24)	0.78	0.56-1.08	0.94	0.68-1.31	0.93	0.66-1.30
Quartile 3 (13.24-<21.10)	0.76	0.53-1.09	0.89	0.62-1.30	0.82	0.57-1.20
Quartile 4 (≥21.10)	0.72	0.46-1.11	0.82	0.52-1.28	0.82	0.52-1.29
% Population without high school diploma ^d						
Quartile 1 (<2.16)	1.00		1.00		1.00	
Quartile 2 (2.16-<4.21)	1.11	0.83-1.49	0.98	0.73-1.30	1.01	0.75-1.35
Quartile 3 (4.21-<7.08)	1.28	0.94-1.73	1.12	0.83-1.52	1.15	0.85-1.56
Quartile 4 (≥7.08)	1.23	0.89-1.70	1.07	0.77-1.48	1.09	0.79-1.51
% Unemployed ^d						
Quartile 1 (<4.18)	1.00		1.00		1.00	
Quartile 2 (4.18-<6.20)	1.09	0.81-1.45	1.06	0.79-1.41	1.06	0.79-1.42
Quartile 3 (6.20-<9.68)	1.24	0.93-1.65	1.12	0.84-1.50	1.18	0.88-1.57
Quartile 4 (≥9.68)	1.23	0.89-1.69	1.16	0.84-1.59	1.24	0.90-1.69
% Living in renter-occupied housing units ^d						
Quartile 1 (<17.42)	1.00		1.00		1.00	

Quartile 2 (17.42-<27.46)	1.04	0.79-1.36	0.88	0.68-1.15	0.86	0.66-1.12
Quartile 3 (27.46-<43.05)	0.96	0.71-1.30	0.80	0.59-1.08	0.80	0.59-1.08
Quartile 4 (\geq 43.05)	1.17	0.81-1.68	0.99	0.69-1.43	0.96	0.67-1.39
% Single-parent households with children ^d						
Quartile 1 (<20.33)	1.00		1.00		1.00	
Quartile 2 (20.33-<30.84)	0.94	0.72-1.23	0.97	0.74-1.27	0.98	0.75-1.29
Quartile 3 (30.84-<46.67)	0.95	0.71-1.27	1.08	0.81-1.45	1.02	0.76-1.37
Quartile 4 (\geq 46.67)	0.73	0.51-1.05	0.82	0.57-1.18	0.74	0.51-1.06
% Population with no car ^d						
Quartile 1 (<2.86)	1.00		1.00		1.00	
Quartile 2 (2.86-<5.47)	1.05	0.79-1.38	1.13	0.85-1.49	1.17	0.89-1.55
Quartile 3 (5.47-<10.44)	0.98	0.72-1.32	0.99	0.73-1.35	1.02	0.75-1.39
Quartile 4 (\geq 10.44)	0.92	0.63-1.33	0.88	0.60-1.29	0.88	0.60-1.29
% Population African American ^d						
Quartile 1 (<0.38)	1.00		1.00		1.00	
Quartile 2 (0.38-<2.64)	1.07	0.83-1.38	1.00	0.77-1.29	1.01	0.78-1.31
Quartile 3 (2.64-<11.40)	0.93	0.70-1.24	0.89	0.67-1.20	0.87	0.65-1.17
Quartile 4 (\geq 11.40)	1.16	0.82-1.64	1.21	0.85-1.72	1.18	0.82-1.68
% Population \geq 65 years old ^d						
Quartile 1 (<9.67)	1.00		1.00		1.00	
Quartile 2 (9.67-<13.23)	0.78	0.62-0.99	0.83	0.65-1.05	0.84	0.66-1.07
Quartile 3 (13.23-<17.20)	0.94	0.74-1.18	0.92	0.72-1.16	0.90	0.71-1.14
Quartile 4 (\geq 17.20)	0.81	0.62-1.05	0.81	0.62-1.05	0.82	0.63-1.06
Median household income ^d						
Quartile 1 (<\$39911)	1.00		1.00		1.00	
Quartile 2 (\$39911-<\$51258)	1.19	0.91-1.56	1.16	0.89-1.50	1.10	0.84-1.43
Quartile 3 (\$51258-<\$66283)	1.18	0.83-1.68	0.95	0.67-1.35	0.90	0.64-1.29
Quartile 4 (\geq \$66283)	1.34	0.81-2.24	1.40	0.85-2.32	1.20	0.72-2.01
Median home value ^d						
Quartile 1 (<\$82500)	1.00		1.00		1.00	
Quartile 2 (\$82500-<\$113600)	0.97	0.77-1.22	0.99	0.79-1.25	1.03	0.82-1.30
Quartile 3 (\$113600-<\$157000)	0.80	0.60-1.06	0.86	0.65-1.14	0.87	0.66-1.16

Quartile 4 (\geq \$157000)	0.72	0.48-1.07	0.81	0.55-1.20	0.91	0.61-1.35
Cancer stage						
0	—	—	1.00		1.00	
I	—	—	1.93	0.82-4.57	1.96	0.82-4.67
II	—	—	8.08*	3.73-17.49	8.24*	3.72-18.28
III	—	—	21.28*	9.86-45.92	22.54*	10.12-50.24
IV	—	—	93.38*	43.61-199.94	68.39*	30.67-152.49
Unknown	—	—	37.69*	14.93-95.15	21.68*	8.11-57.99
Tumor size						
\leq 20 mm	—	—	1.00		1.00	
21-50 mm	—	—	1.00	0.78-1.29	0.96	0.75-1.24
>50 mm	—	—	1.33*	1.02-1.74	1.34*	1.03-1.75
Unknown	—	—	1.90*	1.34-2.69	1.69*	1.19-2.40
Tumor grade						
Well differentiation	—	—	1.00		1.00	
Intermediate differentiation	—	—	1.21	0.83-1.76	1.32	0.91-1.93
Poor differentiation	—	—	1.79*	1.24-2.59	1.89*	1.30-2.74
Unknown	—	—	1.80*	1.16-2.79	1.49	0.96-2.31
Tumor subtype						
ER+ or PR+	—	—	1.00		1.00	
ER- and PR-	—	—	1.92*	1.59-2.31	1.54*	1.18-2.02
Unknown	—	—	0.83	0.53-1.30	0.76	0.47-1.22
Surgical treatment						
Yes	—	—	—	—	0.46*	0.36-0.58
No	—	—	—	—	1.00	
Unknown	—	—	—	—	5.76*	2.39-13.85
Radiation therapy						
Yes	—	—	—	—	0.76*	0.64-0.90
No	—	—	—	—	1.00	
Unknown	—	—	—	—	0.92	0.37-2.29
Chemotherapy						
Yes	—	—	—	—	0.98	0.76-1.27

No	—	—	—	—	1.00	
Unknown	—	—	—	—	0.60	0.25-1.42
Hormone therapy						
Yes	—	—	—	—	0.72*	0.56-0.94
No	—	—	—	—	1.00	
Unknown	—	—	—	—	0.95	0.68-1.33

* $p < 0.05$

Abbreviations: SD, standard deviation; ER, estrogen receptor; PR, progesterone receptor.

^a Model 1 adjusted for age, race and ethnicity, marital status, and ten census tract-level socioeconomic characteristics.

^b Model 2 further adjusted for cancer stage and tumor size, grade, and hormone receptor status.

^c Model 3 further adjusted for surgery, radiation therapy, chemotherapy, and hormone therapy.

^d Characteristics of census tract where patient was living at cancer diagnosis. Overall, census tract code was missing for 1.7% of patients, including 1.9% of patients enrolled before diagnosis and $\leq 1.4\%$ of patients enrolled after diagnosis.

Supplementary Figures

Supplementary Figure 1. Hazard ratios of breast cancer-specific mortality in women with breast cancer enrolled in Medicaid before diagnosis compared to those enrolled peri-diagnosis. The analysis was adjusted for age, race, marital status, socioeconomic characteristics of census tracts, tumor stage, size, grade, hormone receptor subtypes, surgical treatment, radiation therapy, chemotherapy, and hormone therapy. HR indicates hazards ratio.

