**Table S1 -S6**

**Table S1.** Univariate Logistic Regression for the Presence of Liver Metastases at Diagnosis of Breast Cancera

**Table S2.** Association of Sociodemographic and Clinical Characteristics for the Presence of Liver Metastases at Diagnosis of Breast Cancer Stratified by HER2 Status Among Entire Cohorta

**Table S3.** Association of Sociodemographic and Clinical Characteristics for the Presence of Liver Metastases at Diagnosis of Breast Cancer Stratified by HER2 Status Among Subset With Metastatic Diseasea

**Table S4.** Univariate Cox Regression for All-Cause Mortality and Breast Cancer–Specific Mortality Among Patients With Liver Metastasesa

**Table S5.** Association of Sociodemographic and Clinical Characteristics for All-Cause Mortality Among Patients With Liver Metastases Stratified by HER2 Statusa

**Table S6.** Association of Sociodemographic and Clinical Characteristics for Breast Cancer–Specific Mortality Among Patients With Liver Metastases Stratified by HER2 Statusa

|  |
| --- |
| **Table S1.** Univariate Logistic Regression for the Presence of Liver Metastases at Diagnosis of Breast Cancera |
| **Variable** | **Patients, No.** | **Among Entire Cohort** | **Among Subset With Metastatic Disease** |
| **Patients****(*n* = 298,370)** |  |  |
| **With Liver Metastases****(*n* = 4,285)** | **OR (95% CI)** | ***P* Value** | **OR (95% CI)** | ***P* Value** |
| Age at diagnosis, yb |  |  |  |  |  |  |
| 18-40 | 16,957 | 404 | 1[Reference] |  | 1[Reference] |  |
| 41-60 | 122,483 | 1,886 | 0.64(0.56-0.71) | <0.001  | 0.76(0.66-0.87) | <0.001 |
| 61-80 | 130,478 | 1,608 | 0.51(0.46-0.57) | <0.001  | 0.54(0.47-0.62) | <0.001  |
| >80 | 28,452 | 387 | 0.57(0.49-0.65) | <0.001  | 0.44(0.37-0.52) | <0.001  |
| Raceb |  |  |  |  |  |  |
| White | 206,898 | 2,773 | 1[Reference] |  | 1[Reference] |  |
| Black | 32,687 | 769 | 1.77(1.64-1.92) | <0.001 | 1.15(1.05-1.27) | 0.004 |
| Hispanic | 31,953 | 410 | 0.96(0.86-1.06) | 0.407  | 0.93(0.821.05) | 0.231 |
| Asian | 24,580 | 300 | 0.91(0.81-1.03) | 0.121 | 1.15(0.99-1.32) | 0.062 |
| Other | 2,252 | 33 | 1.10(0.78-1.55) | 0.608 | 1.11(0.73-1.67) | 0.632 |
| Marital status |  |  |  |  |  |  |
| Unmarried | 121,864 | 2,196 | 1[Reference] |  | 1[Reference] |  |
| Married | 159,687 | 1,812 | 0.63(0.59-0.67) | <0.001  | 0.83(0.71-0.97) | 0.016 |
| Unknown | 16,819 | 277 | 0.91(0.80-1.04) | 0.154 | 0.88(0.76-1.03) | 0.116 |
| Insurance status |  |  |  |  |  |  |
| Uninsured | 5,251 | 222 | 1[Reference] |  | 1[Reference] |  |
| Insured | 287,373 | 3,954 | 0.32(0.28-0.36) | <0.001 | 0.76(0.64-0.90) | 0.001 |
| Unknown | 5,746 | 109 | 0.44(0.35-0.55) | <0.001 | 0.88(0.66-1.16) | 0.350 |
| Tumor size |  |  |  |  |  |  |
| <2.0 cm | 158,893 | 489 | 1[Reference] |  | 1[Reference] |  |
| 2.0-4.9 cm | 97,757 | 1,435 | 4.83(4.35-5.35) | <0.001 | 1.05(0.93-1.18) | 0.444 |
| ≥5.0 cm | 25,401 | 1,266 | 16.99(15.30-18.88) | <0.001 | 1.10(0.97-1.24) | 0.149 |
| Unknown | 16,319 | 1,095 | 23.30(20.92-25.95) | <0.001 | 1.24(1.09-1.41) | 0.001 |
| Grade |  |  |  |  |  |  |
| I | 64,645 | 167 | 1[Reference] |  | 1[Reference] |  |
| II | 123,484 | 1,195 | 3.77(3.21-4.44) | <0.001 | 1.51(1.26-1.81) | <0.001 |
| III/IV | 91,612 | 1,845 | 7.94(6.77-9.30) | <0.001 | 2.38(2.00-2.85) | <0.001  |
| Unknown | 18,629 | 1,078 | 23.71(20.13-27.94) | <0.001 | 1.93(1.61-2.32) | <0.001  |
| Stage |  |  |  |  |  |  |
| I | 149,108 |  |  |  |  |  |
| II | 93,838 |  |  |  |  |  |
| III | 31,662 |  |  |  |  |  |
| IV | 10,213 | 4,285 |  |  |  |  |
| Unknown | 9,264 |  |  |  |  |  |
| T |  |  |  |  |  |  |
| T1 | 172,939 | 469 | 1[Reference] |  | 1[Reference] |  |
| T2 | 85,733 | 1,108 | 4.82(4.32-5.37) | <0.001 | 1.06(0.94-1.21) | 0.337 |
| T3 | 17,787 | 567 | 12.11(10.71-13.70) | <0.001 | 1.02(0.88-1.17) | 0.829 |
| T4 | 12,391 | 1281 | 42.40(38.08-47.21) | <0.001 | 1.17(1.03-1.32) | 0.015 |
| Unknown | 9,520 | 860 | 36.52(32.57-40.95) | <0.001 | 1.34(1.17-1.53) | <0.001 |
| N |  |  |  |  |  |  |
| N0 | 202,600 | 971 | 1[Reference] |  | 1[Reference] |  |
| N1 | 66,606 | 1,847 | 5.92(5.48-6.40) | <0.001 | 1.24(1.13-1.36) | <0.001 |
| N2 | 15,067 | 417 | 5.91(5.26-6.64) | <0.001 | 1.07(0.94-1.23) | 0.300 |
| N3 | 9,633 | 473 | 10.72(9.59-11.99) | <0.001 | 1.01(0.89-1.15) | 0.831 |
| Unknown | 4,464 | 577 | 30.82(27.67-34.33) | <0.001 | 1.32(1.17-1.50) | <0.001 |
| Extrahepatic metastatic sites to lung, brain and bone, No. |  |  |  |  |
| 0/1 | 284,444 | 2,816 | 1[Reference] |  | 1[Reference] |  |
| 2 | 2,763 | 962 | 55.32(50.73-60.32) | <0.001  | 1.47(1.35-1.61) | <0.001 |
| All 3 | 361 | 187 | 111.30(90.24-137.27) | <0.001  | 2.96(2.40-3.66) | <0.001 |
| Unknown | 802 | 320 | 68.75(59.41-79.57) | <0.001  | 1.83(1.58-2.12) | <0.001 |
| Radiation |  |  |  |  |  |  |
| Yes | 138,318 | 1,054 | 1[Reference] |  | 1[Reference] |  |
| No/Unknown | 160,052 | 3,231 | 2.68(2.50-2.88) | <0.001 | 1.59(1.46-1.72) | <0.001 |
| Chemotherapy |  |  |  |  |  |  |
| Yes | 115,409 | 2,407 | 1[Reference] |  | 1[Reference] |  |
| No/Unknown | 182,961 | 1,878 | 0.49(0.46-0.52) | <0.001 | 0.60(0.56-0.65) | <0.001 |
| Subtype |  |  |  |  |  |  |
| HR+/HER2− | 202,713 | 1,652 | 1[Reference] |  | 1[Reference] |  |
| HR+/HER2+ | 28,453 | 806 | 3.55(3.26-3.86) | <0.001  | 2.42(2.18-2.68) | <0.001  |
| HR−/HER2+ | 12,321 | 543 | 5.61(5.08-6.19) | <0.001  | 3.94(3.45-4.51) | <0.001  |
| Triple-negative | 31,632 | 548 | 2.15(1.95-2.37) | <0.001  | 1.81(1.61-2.03) | <0.001  |
| Unknown | 23,251 | 736 | 3.98(3.64-4.34) | <0.001  | 1.67(1.51-1.86) | <0.001  |
|  |  |  |  |  |  |  |

NOTE. HER2, human epidermal growth factor receptor 2; HR, hormone receptor; OR, odds ratio. +Denotes positive; −denotes negative.

aA *P* value <0.05 was considered statistically significant.

bUnknown age and unknown race removed from model owing to nonconvergence (*n* = 1,055).

**Table S2.** Association of Sociodemographic and Clinical Characteristics for the Presence of Liver Metastases at Diagnosis of Breast Cancer Stratified by HER2 Status Among Entire Cohorta

|  |  |  |  |
| --- | --- | --- | --- |
| **Variable** | **HER2-** | **HER2+** | **Unknown** |
| **Patients, No.****With Liver Metastases** | **OR(95% CI)** | **Patients, No.****With Liver Metastases** | **OR(95% CI)** | **Patients, No.****With Liver Metastases** | **OR(95% CI)** |
| Age at diagnosis, yb |  |  |  |  |  |  |
| 18-40 | 194 | 1[Reference] | 184 | 1[Reference] | 26 | 1[Reference] |
| 41-60 | 978 | 0.63(0.54-0.74) | 658 | 0.71(0.60-0.84) | 250 | 1.26(0.84-1.90) |
| 61-80 | 853 | 0.48(0.41-0.57) | 440 | 0.56(3.49-0.79) | 315 | 1.39(0.93-2.08) |
| >80 | 198 | 0.53(0.43-0.65) | 80 | 0.51(2.79-0.88) | 109 | 1.43(0.93-2.20) |
| *P*interaction<0.001 |  |  |  |  |  |  |
| Raceb |  |  |  |  |  |  |
| White | 1,444 | 1[Reference] | 856 | 1[Reference] | 473 | 1[Reference] |
| Black | 412 | 1.92(1.72-2.14) | 239 | 1.46(1.26-1.69) | 118 | 1.40(1.14-1.72) |
| Hispanic | 200 | 0.95(0.82-1.10) | 147 | 0.88(0.74-1.05) | 63 | 0.72(0.55-0.94) |
| Asian | 150 | 0.93(0.78-1.10) | 111 | 0.79(0.65-0.97) | 39 | 0.68(0.49-0.95) |
| Other | 17 | 1.15(0.71-1.86) | 9 | 0.72(0.37-1.40) | 7 | 1.26(0.59-2.71) |
| *P*interaction<0.001 |  |  |  |  |  |  |
| Marital status |  |  |  |  |  |  |
| Unmarried | 1,124 | 1[Reference] | 677 | 1[Reference] | 395 | 1[Reference] |
| Married | 955 | 0.64(0.59-0.70) | 601 | 0.63(0.56-0.71) | 256 | 0.61(0.52-0.71) |
| Unknown | 144 | 0.97(0.81-1.15) | 84 | 0.95(0.76-1.20) | 49 | 0.59(0.44-0.80) |
| *P*interaction<0.001 |  |  |  |  |  |  |
| Insurance status |  |  |  |  |  |  |
| Uninsured | 103 | 1[Reference] | 62 | 1[Reference] | 57 | 1[Reference] |
| Insured | 2,075 | 0.26(0.19-0.34) | 1275 | 0.48(0.37-0.62) | 604 | 0.33(0.27-0.40) |
| Unknown | 45 | 0.30(0.20-0.46) | 25 | 0.56(0.35-0.89) | 39 | 0.41(0.29-0.59) |
| *P*interaction<0.001 |  |  |  |  |  |  |
| Tumor size |  |  |  |  |  |  |
| <2.0 cm | 267 | 1[Reference] | 161 | 1[Reference] | 61 | 1[Reference] |
| 2.0-4.9 cm | 765 | 5.05(4.40-5.81) | 505 | 3.35(2.80-4.01) | 165 | 4.51(3.36-6.06) |
| ≥5.0 cm | 702 | 19.54(16.96-22.51) | 420 | 9.72(8.09-11.70) | 144 | 12.12(8.95-16.42) |
| Unknown | 489 | 31.0(26.66-36.05) | 276 | 11.47(9.41-14.00) | 330 | 10.48(7.96-13.80) |
| *P*interaction<0.001 |  |  |  |  |  |  |
| Grade |  |  |  |  |  |  |
| I | 131 | 1[Reference] | 16 | 1[Reference] | 20 | 1[Reference] |
| II | 726 | 3.20(2.66-3.86) | 377 | 3.46(2.09-5.72) | 92 | 2.43(1.49-3.94) |
| III/IV | 949 | 6.81(5.67-8.18) | 752 | 4.33(2.63-7.12) | 144 | 4.79(2.99-7.66) |
| Unknown | 417 | 19.32(15.86-23.54) | 217 | 11.88(7.13-19.82) | 444 | 14.78(9.42-23.18) |
| *P*interaction<0.001 |  |  |  |  |  |  |
| T |  |  |  |  |  |  |
| T1 | 271 | 1[Reference] | 141 | 1[Reference] | 57 | 1[Reference] |
| T2 | 607 | 4.83(4.18-5.57) | 394 | 3.76(3.10-4.57) | 107 | 4.64(3.36-6.41) |
| T3 | 317 | 12.84(10.91-15.12) | 204 | 8.88(7.14-11.04) | 46 | 7.76(5.24-11.50) |
| T4 | 650 | 45.42(39.34-52.43) | 450 | 23.85(19.65-28.95) | 181 | 34.06(25.13-46.17) |
| Unknown | 378 | 45.80(39.07-53.68) | 173 | 23.17(18.38-29.19) | 309 | 18.91(14.22-25.15) |
| *P*interaction<0.001 |  |  |  |  |  |  |
| N |  |  |  |  |  |  |
| N0 | 523 | 1[Reference] | 268 | 1[Reference] | 180 | 1[Reference] |
| N1 | 970 | 6.09(5.47-6.78 | 658 | 5.03(4.35-5.81) | 219 | 4.96(4.06-6.06) |
| N2 | 230 | 6.47(5.54-7.57) | 148 | 4.54(3.70-5.57) | 39 | 4.42(3.12-6.31) |
| N3 | 255 | 11.74(10.09-13.66) | 174 | 7.82(6.42-9.52) | 44 | 8.11(5.76-11.42) |
| Unknown | 245 | 40.16(34.28-47.04) | 114 | 27.81(21.81-35.46) | 218 | 11.42(9.31-14.00) |
| *P*interaction<0.001 |  |  |  |  |  |  |
| Extrahepatic metastatic sites to lung, brain and bone, No. |  |  |  |  |  |  |
| 0/1 | 1,459 | 1[Reference] | 953 | 1[Reference] | 404 | 1[Reference] |
| 2 | 515 | 65.41(58.32-73.37) | 278 | 41.07(34.37-49.09) | 169 | 32.59(26.29-40.42) |
| All 3 | 109 | 165.87(126.17-218.06) | 50 | 47.76(31.61-72.16) | 28 | 55.40(32.36-94.86) |
| Unknown | 140 | 70.34(57.27-86.40) | 81 | 43.78(31.80-60.26) | 99 | 58.12(43.01-78.55) |
| *P*interaction<0.001 |  |  |  |  |  |  |
| Radiation |  |  |  |  |  |  |
| Yes | 591 | 1[Reference] | 358 | 1[Reference] | 105 | 1[Reference] |
| No/Unknown | 1,632 | 2.61(2.38-2.87) | 1,004 | 2.18(1.93-2.46) | 595 | 2.61(2.12-3.22) |
| *P*interaction<0.001 |  |  |  |  |  |  |
| Chemotherapy |  |  |  |  |  |  |
| Yes | 1,219 | 1[Reference] | 970 | 1[Reference] | 218 | 1[Reference] |
| No/Unknown | 1,004 | 0.44(0.41-0.48) | 392 | 0.81(0.72-0.91) | 482 | 0.71(0.61-0.84) |
| *P*interaction<0.001 |  |  |  |  |  |  |

NOTE. HER2, human epidermal growth factor receptor 2; HR, hormone receptor. +Denotes positive; −denotes negative.

aA *P* value <0.05 was considered statistically significant.

bUnknown age and unknown race removed from model owing to nonconvergence (*n* = 1,055).

**Table S3.** Association of Sociodemographic and Clinical Characteristics for the Presence of Liver Metastases at Diagnosis of Breast Cancer Stratified by HER2 Status Among Subset With Metastatic Disease a

|  |  |  |  |
| --- | --- | --- | --- |
| **Variable** | **HER2-** | **HER2+** | **Unknown** |
| **Patients, No.****With Liver Metastases** | **OR(95% CI)** | **Patients, No.****With Liver Metastases** | **OR(95% CI)** | **Patients, No.****With Liver Metastases** | **OR(95% CI)** |
| Age at diagnosis, yb |  |  |  |  |  |  |
| 18-40 | 194 | 1[Reference] | 184 | 1[Reference] | 26 | 1[Reference] |
| 41-60 | 978 | 0.75(0.62-0.91) | 658 | 0.85(0.67-1.07) | 250 | 1.08(0.65-1.79) |
| 61-80 | 853 | 0.54(0.44-0.65) | 440 | 0.68(0.54-0.87) | 315 | 0.77(0.47-1.27) |
| >80 | 198 | 0.46(0.37-0.59) | 80 | 0.57(0.40-0.80) | 109 | 0.53(0.31-0.90) |
| *P*interaction<0.001 |  |  |  |  |  |  |
| Raceb |  |  |  |  |  |  |
| White | 1,444 | 1[Reference] | 856 | 1[Reference] | 473 | 1[Reference] |
| Black | 412 | 1.24(1.09-1.41) | 239 | 1.01(0.83-1.22) | 118 | 0.98(0.77-1.25) |
| Hispanic | 200 | 0.91(0.77-1.08) | 147 | 0.81(0.65-1.02) | 63 | 0.94(0.68-1.28) |
| Asian | 150 | 1.12(0.92-1.36) | 111 | 1.06(0.81-1.38) | 39 | 1.12(0.75-1.68) |
| Other | 17 | 1.07(0.62-1.86) | 9 | 1.00(0.41-2.42) | 7 | 1.51(0.57-3.99) |
| *P*interaction<0.001 |  |  |  |  |  |  |
| Marital status |  |  |  |  |  |  |
| Unmarried | 1,124 | 1[Reference] | 677 | 1[Reference] | 395 | 1[Reference] |
| Married | 955 | 1.05(0.95-1.16) | 601 | 1.01(0.87-1.17) | 256 | 1.19(0.99-1.45) |
| Unknown | 144 | 1.26(1.03-1.54) | 84 | 1.01(0.74-1.37) | 49 | 1.25(0.87-1.81) |
| *P*interaction<0.001 |  |  |  |  |  |  |
| Insurance status |  |  |  |  |  |  |
| Uninsured | 103 | 1[Reference] | 62 | 1[Reference] | 57 | 1[Reference] |
| Insured | 2,075 | 0.82(0.65-1.03) | 1275 | 1.02(0.72-1.43) | 604 | 0.48(0.33-0.69) |
| Unknown | 45 | 0.91(0.60-1.37) | 25 | 0.87(0.48-1.61) | 39 | 0.66(0.39-1.13) |
| *P*interaction<0.001 |  |  |  |  |  |  |
| Tumor size |  |  |  |  |  |  |
| <2.0 cm | 267 | 1[Reference] | 161 | 1[Reference] | 61 | 1[Reference] |
| 2.0-4.9 cm | 765 | 1.04(0.89-1.22) | 505 | 1.03(0.81-1.30) | 165 | 1.01(0.71-1.43) |
| ≥5.0 cm | 702 | 1.15(0.98-1.35) | 420 | 0.98(0.77-1.25) | 144 | 0.99(0.69-1.41) |
| Unknown | 489 | 1.27(1.07-1.50) | 276 | 1.02(0.79-1.32) | 330 | 1.25(0.90-1.73) |
| *P*interaction<0.001 |  |  |  |  |  |  |
| Grade |  |  |  |  |  |  |
| I | 131 | 1[Reference] | 16 | 1[Reference] | 20 | 1[Reference] |
| II | 726 | 1.35(1.10-1.65) | 377 | 1.34(0.72-2.50) | 92 | 0.90(0.51-1.58) |
| III/IV | 949 | 1.06(1.68-2.52) | 752 | 1.63(0.88-3.02) | 144 | 1.49(0.85-2.58) |
| Unknown | 417 | 1.63(1.31-2.02) | 217 | 1.51(0.80-2.84) | 444 | 1.27(0.75-2.15) |
| *P*interaction<0.001 |  |  |  |  |  |  |
| T |  |  |  |  |  |  |
| T1 | 271 | 1[Reference] | 141 | 1[Reference] | 57 | 1[Reference] |
| T2 | 607 | 1.00(0.85-1.18) | 394 | 1.20(0.93-1.55) | 107 | 0.95(0.65-1.40) |
| T3 | 317 | 1.00(0.83-1.21) | 204 | 1.11(0.84-1.48) | 46 | 0.68(0.44-1.07) |
| T4 | 650 | 1.09(0.93-1.28) | 450 | 1.15(0.90-1.47) | 181 | 1.23(0.86-1.75) |
| Unknown | 378 | 1.34(1.12-1.60) | 173 | 1.39(1.03-1.88) | 309 | 1.27(0.91-1.78) |
| *P*interaction<0.001 |  |  |  |  |  |  |
| N |  |  |  |  |  |  |
| N0 | 523 | 1[Reference] | 268 | 1[Reference] | 180 | 1[Reference] |
| N1 | 970 | 1.20(1.06-1.36) | 658 | 1.21(1.00-1.46) | 219 | 1.13(0.90-1.43) |
| N2 | 230 | 1.08(0.90-1.29) | 148 | 0.90(0.69-1.17) | 39 | 1.14(0.75-1.74) |
| N3 | 255 | 0.99(0.84-1.17) | 174 | 0.90(0.70-1.15) | 44 | 1.05(0.71-1.56) |
| Unknown | 245 | 1.29(1.08-1.54) | 114 | 1.35(0.99-1.83) | 218 | 1.34(1.06-1.70) |
| *P*interaction<0.001 |  |  |  |  |  |  |
| Extrahepatic metastatic sites to lung, brain and bone, No. |  |  |  |  |  |  |
| 0/1 | 1,459 | 1[Reference] | 953 | 1[Reference] | 404 | 1[Reference] |
| 2 | 515 | 1.52(1.35-1.71) | 278 | 1.36(1.13-1.64) | 169 | 1.68(1.35-2.10) |
| All 3 | 109 | 3.84(2.92-5.06) | 50 | 1.58(1.04-2.39) | 28 | 2.86(1.67-4.91) |
| Unknown | 140 | 1.63(1.32-2.00) | 81 | 1.45(1.05-2.00) | 99 | 3.00(2.21-4.08) |
| *P*interaction<0.001 |  |  |  |  |  |  |
| Radiation |  |  |  |  |  |  |
| Yes | 591 | 1[Reference] | 358 | 1[Reference] | 105 | 1[Reference] |
| No/Unknown | 1632 | 1.55(1.39-1.72) | 1,004 | 1.62(1.38-1.89) | 595 | 1.66(1.31-2.11) |
| *P*interaction<0.001 |  |  |  |  |  |  |
| Chemotherapy |  |  |  |  |  |  |
| Yes | 1,219 | 1[Reference] | 970 | 1[Reference] | 218 | 1[Reference] |
| No/Unknown | 1,004 | 0.58(0.52-0.63) | 392 | 0.91(0.78-1.06) | 482 | 0.78(0.64-0.95) |
| *P*interaction<0.001 |  |  |  |  |  |  |

NOTE. HER2, human epidermal growth factor receptor 2; HR, hormone receptor; OR, odds ratio. +Denotes positive; −denotes negative.

aA *P* value <0.05 was considered statistically significant.

bUnknown age and unknown race removed from model owing to nonconvergence (*n* = 1,055).

|  |
| --- |
| **Table S4.** Univariate Cox Regression for All-Cause Mortality and Breast Cancer–Specific Mortality Among Patients With Liver Metastasesa |
| **Variable** | **Patients, No.** | **All-cause Mortality** | **Breast Cancer-Specific Mortality** |
| **Patients****(*n* = 298,370)** | **With Liver Metastases****(*n* = 4,285)** | **Hazard Ratio (95% CI)** | ***P* Value** | **Hazard Ratio (95% CI)** | ***P* Value** |
| Age at diagnosis, yb |  |  |  |  |  |  |
| 18-40 | 16,957 | 404 | 1[Reference] |  | 1[Reference] |  |
| 41-60 | 122,483 | 1,886 | 1.58(1.33-1.87) | <0.001 | 1.57(1.31-1.87) | <0.001 |
| 61-80 | 130,478 | 1,608 | 2.45(2.06-2.90) | <0.001  | 2.33(1.95-2.79) | <0.001  |
| >80 | 28,452 | 387 | 4.35(3.59-5.27) | <0.001  | 3.87(3.14-4.75) | <0.001  |
| Raceb |  |  |  |  |  |  |
| White | 206,898 | 2,773 | 1[Reference] |  | 1[Reference] |  |
| Black | 32,687 | 769 | 1.11(1.01-1.23) | 0.038  | 1.12(1.00-1.25) | 0.045  |
| Hispanic | 31,953 | 410 | 0.87(0.76-1.00) | 0.056 | 0.84(0.72-0.98) | 0.024  |
| Asian | 24,580 | 300 | 0.92(0.79-1.08) | 0.327  | 0.87(0.73-1.04) | 0.116  |
| Other | 2,252 | 33 | 0.71(0.43-1.16) | 0.173 | 0.71(0.42-1.20) | 0.200 |
| Marital status |  |  |  |  |  |  |
| Unmarried | 121,864 | 2,196 | 1[Reference] |  | 1[Reference] |  |
| Married | 159,687 | 1,812 | 0.72(0.66-0.78) | <0.001  | 0.73(0.67-0.80) | <0.001  |
| Unknown | 16,819 | 277 | 0.95(0.81-1.12) | 0.560  | 0.70(0.81-1.15) | 0.695 |
| Insurance status |  |  |  |  |  |  |
| Uninsured | 5,251 | 222 | 1[Reference] |  | 1[Reference] |  |
| Insured | 287,373 | 3,954 | 0.60(0.51-0.70) | <0.001  | 0.61(0.51-0.73) | <0.001  |
| Unknown | 5,746 | 109 | 0.68(0.51-0.90) | 0.008 | 0.78(0.58-1.05) | 0.098 |
| Tumor size |  |  |  |  |  |  |
| <2.0 cm | 158,893 | 489 | 1[Reference] |  | 1[Reference] |  |
| 2.0-4.9 cm | 97,757 | 1,435 | 1.06(0.92-1.22) | 0.407 | 1.15(0.98-1.34) | 0.081 |
| ≥5.0 cm | 25,401 | 1,266 | 1.25(1.09-1.44) | 0.002 | 1.41(1.21-1.65) | <0.001 |
| Unknown | 16,319 | 1,095 | 1.66(1.44-1.91) | <0.001 | 1.81(1.55-2.11) | <0.001 |
| Grade |  |  |  |  |  |  |
| I | 64,645 | 167 | 1[Reference] |  | 1[Reference] |  |
| II | 123,484 | 1,195 | 1.09(0.87-1.36) | 0.453 | 1.25(0.97-1.60) | 0.088 |
| III/IV | 91,612 | 1,845 | 1.27(1.02-1.58) | 0.031 | 1.45(1.14-1.86) | 0.003 |
| Unknown | 18,629 | 1,078 | 1.84(1.47-2.29) | <0.001 | 1.96(1.52-2.51) | <0.001 |
| Stage |  |  |  |  |  |  |
| I | 149,108 |  |  |  |  |  |
| II | 93,838 |  |  |  |  |  |
| III | 31,662 |  |  |  |  |  |
| IV | 10,213 | 4,285 |  |  |  |  |
| Unknown | 9,264 |  |  |  |  |  |
| T |  |  |  |  |  |  |
| T1 | 172,939 | 469 | 1[Reference] |  | 1[Reference] |  |
| T2 | 85,733 | 1,108 | 0.99(0.85-1.15) | 0.907 | 1.04(0.88-1.22) | 0.648 |
| T3 | 17,787 | 567 | 1.07(0.90-1.26) | 0.455 | 1.20(1.01-1.44) | 0.044 |
| T4 | 12,391 | 1281 | 1.40(1.21-1.61) | <0.001 | 1.51(1.29-1.76) | <0.001 |
| Unknown | 9,520 | 860 | 1.92(1.66-2.22) | <0.001 | 1.65(1.65-2.28) | <0.001 |
| N |  |  |  |  |  |  |
| N0 | 202,600 | 971 | 1[Reference] |  | 1[Reference] |  |
| N1 | 66,606 | 1,847 | 0.79(0.71-0.87) | <0.001 | 0.85(0.76-0.95) | 0.004 |
| N2 | 15,067 | 417 | 0.75(0.64-0.87) | <0.001 | 0.83(0.71-0.98) | 0.024 |
| N3 | 9,633 | 473 | 0.77(0.66-0.89) | <0.001 | 0.84(0.72-0.98) | 0.030 |
| Unknown | 4,464 | 577 | 1.30(1.15-1.47) | <0.001 | 1.31(1.14-1.50) | <0.001 |
| Extrahepatic metastatic sites to lung, brain and bone, No. |  |  |  |  |
| 0/1 | 284,444 | 2,816 | 1[Reference] |  | 1[Reference] |  |
| 2 | 2,763 | 962 | 1.41(1.29-1.55) | <0.001  | 1.43(1.30-1.58) | <0.001  |
| All 3 | 361 | 187 | 2.01(1.70-2.40) | <0.001  | 1.93(1.59-2.33) | <0.001  |
| Unknown | 802 | 320 | 1.61(1.40-1.85) | <0.001  | 1.60(1.38-1.86) | <0.001  |
| Radiation |  |  |  |  |  |  |
| Yes | 138,318 | 1,054 | 1[Reference] |  | 1[Reference] |  |
| No/Unknown | 160,052 | 3,231 | 1.27(1.16-1.40) | <0.001 | 1.23(1.12-1.36) | <0.001 |
| Chemotherapy |  |  |  |  |  |  |
| Yes | 115,409 | 2,407 | 1[Reference] |  | 1[Reference] |  |
| No/Unknown | 182,961 | 1,878 | 2.13(1.97-2.30) | <0.001 | 2.03(1.86-2.20) | <0.001 |
| Subtype |  |  |  |  |  |  |
| HR+/HER2− | 202,713 | 1,652 | 1[Reference] |  | 1[Reference] |  |
| HR+/HER2+ | 28,453 | 806 | 0.70(0.62-0.79) | <0.001  | 0.71(0.62-0.81) | <0.001  |
| HR−/HER2+ | 12,321 | 543 | 0.92(0.81-1.05) | 0.227  | 0.94(0.81-1.08) | 0.353  |
| Triple-negative | 31,632 | 548 | 1.86(1.66-2.09) | <0.001  | 1.88(1.67-2.13) | <0.001  |
| Unknown | 23,251 | 736 | 2.06(1.86-2.29) | <0.001  | 1.91(1.70-2.14) | <0.001  |

NOTE. HER2, human epidermal growth factor receptor 2; HR, hormone receptor; OR, odds ratio. +Denotes positive; −denotes negative.

aA *P* value <0.05 was considered statistically significant.

bUnknown age and unknown race removed from model owing to nonconvergence (*n* = 1,055).

**Table S5.** Association of Sociodemographic and Clinical Characteristics for All-Cause Mortality Among Patients With Liver Metastases Stratified by HER2 Statusa

|  |  |  |  |
| --- | --- | --- | --- |
| **Variable** | **HER2-** | **HER2+** | **Unknown** |
| **Patients, No.****With Liver Metastases** | **HR(95% CI)** | **Patients, No.****With Liver Metastases** | **HR(95% CI)** | **Patients, No.****With Liver Metastases** | **HR(95% CI)** |
| Age at diagnosis, yb |  |  |  |  |  |  |
| 18-40 | 194 | 1[Reference] | 184 | 1[Reference] | 26 | 1[Reference] |
| 41-60 | 978 | 1.24(1.00-1.54) | 658 | 2.00(1.44-2.76) | 250 | 1.60(0.91-2.81) |
| 61-80 | 853 | 1.84(1.49-2.28) | 440 | 3.15(2.27-4.37) | 315 | 2.10(1.20-3.66) |
| >80 | 198 | 2.87(2.23-3.69) | 80 | 7.17(4.84-10.62) | 109 | 3.21(1.80-5.73) |
| *P*interaction<0.001 |  |  |  |  |  |  |
| Raceb |  |  |  |  |  |  |
| White | 1,444 | 1[Reference] | 856 | 1[Reference] | 473 | 1[Reference] |
| Black | 412 | 1.11(0.97-1.27) | 239 | 1.09(0.89-1.35) | 118 | 1.29(1.03-1.61) |
| Hispanic | 200 | 0.86(0.70-1.04) | 147 | 0.97(0.75-1.27) | 63 | 0.86(0.63-1.17) |
| Asian | 150 | 0.97(0.78-1.20) | 111 | 1.17(0.88-1.56) | 39 | 0.60(0.38-0.94) |
| Other | 17 | 0.75(0.39-1.45) | 9 | 0.71(0.23-2.22) | 7 | 0.54(0.20-1.44) |
| *P*interaction<0.001 |  |  |  |  |  |  |
| Marital status |  |  |  |  |  |  |
| Unmarried | 1,124 | 1[Reference] | 677 | 1[Reference] | 395 | 1[Reference] |
| Married | 955 | 0.70(0.63-0.78) | 601 | 0.73(0.62-0.86) | 256 | 0.83(0.69-0.99) |
| Unknown | 144 | 0.90(0.72-1.12) | 84 | 1.03(0.75-1.42) | 49 | 0.99(0.71-1.39) |
| *P*interaction<0.001 |  |  |  |  |  |  |
| Insurance status |  |  |  |  |  |  |
| Uninsured | 103 | 1[Reference] | 62 | 1[Reference] | 57 | 1[Reference] |
| Insured | 2,075 | 0.52(0.42-0.66) | 1275 | 0.82(0.56-1.20) | 604 | 0.71(0.53-0.96) |
| Unknown | 45 | 0.50(0.32-0.77) | 25 | 0.73(0.34-1.54) | 39 | 0.75(0.47-1.18) |
| *P*interaction<0.001 |  |  |  |  |  |  |
| Tumor size |  |  |  |  |  |  |
| <2.0 cm | 267 | 1[Reference] | 161 | 1[Reference] | 61 | 1[Reference] |
| 2.0-4.9 cm | 765 | 1.00(0.84-1.20) | 505 | 1.19(0.90-1.57) | 165 | 1.21(0.85-1.72) |
| ≥5.0 cm | 702 | 1.21(1.01-1.45)\_ | 420 | 1.32(0.99-1.75) | 144 | 1.40(0.98-2.01) |
| Unknown | 489 | 1.44(1.19-1.74) | 276 | 1.84(1.37-2.47) | 330 | 1.34(0.96-1.86) |
| *P*interaction<0.001 |  |  |  |  |  |  |
| Grade |  |  |  |  |  |  |
| I | 131 | 1[Reference] | 16 | 1[Reference] | 20 | 1[Reference] |
| II | 726 | 1.26(0.97-1.64) | 377 | 0.92(0.45-1.87) | 92 | 0.78(0.44-1.41) |
| III/IV | 949 | 1.78(1.38-2.30) | 752 | 0.81(0.40-1.64) | 144 | 1.21(0.69-2.10) |
| Unknown | 417 | 1.69(1.29-2.21) | 217 | 1.16(0.57-2.37) | 444 | 1.48(0.87-2.53) |
| *P*interaction<0.001 |  |  |  |  |  |  |
| T |  |  |  |  |  |  |
| T1 | 271 | 1[Reference] | 141 | 1[Reference] | 57 | 1[Reference] |
| T2 | 607 | 0.95(0.78-1.15) | 394 | 1.07(0.80-1.44) | 107 | 1.24(0.84-1.84) |
| T3 | 317 | 1.08(0.87-1.33) | 204 | 1.00(0.71-1.41) | 46 | 1.50(0.95-2.37) |
| T4 | 650 | 1.48(1.23-1.78) | 450 | 1.27(0.95-1.70) | 181 | 1.61(1.12-2.31) |
| Unknown | 378 | 1.64(1.34-2.00) | 173 | 2.06(1.50-2.82) | 309 | 1.61(1.14-2.28) |
| *P*interaction<0.001 |  |  |  |  |  |  |
| N |  |  |  |  |  |  |
| N0 | 523 | 1[Reference] | 268 | 1[Reference] | 180 | 1[Reference] |
| N1 | 970 | 0.94(0.82-1.07) | 658 | 0.61(0.50-0.74) | 219 | 0.99(0.79-1.25) |
| N2 | 230 | 0.83(0.68-1.01) | 148 | 0.65(0.49-0.87) | 39 | 1.05(0.71-1.56) |
| N3 | 255 | 0.96(0.80-1.16) | 174 | 0.58(0.44-0.77) | 44 | 0.90(0.61-1.34) |
| Unknown | 245 | 1.24(1.03-1.50) | 114 | 1.21(0.92-1.59) | 218 | 1.08(0.87-1.35) |
| *P*interaction<0.001 |  |  |  |  |  |  |
| Extrahepatic metastatic sites to lung, brain and bone, No. |  |  |  |  |  |  |
| 0/1 | 1,459 | 1[Reference] | 953 | 1[Reference] | 404 | 1[Reference] |
| 2 | 515 | 1.36(1.20-1.54) | 278 | 1.58(1.31-1.91) | 169 | 1.17(0.95-1.43) |
| All 3 | 109 | 1.84(1.46-2.32) | 50 | 2.55(1.81-3.60) | 28 | 1.81(1.21-2.70) |
| Unknown | 140 | 1.24(1.00-1.53) | 81 | 2.00(1.49-2.68) | 99 | 1.34(1.05-1.71) |
| *P*interaction<0.001 |  |  |  |  |  |  |
| Radiation |  |  |  |  |  |  |
| Yes | 591 | 1[Reference] | 358 | 1[Reference] | 105 | 1[Reference] |
| No/Unknown | 1,632 | 1.16(1.03-1.31) | 1,004 | 1.17(0.98-1.40) | 595 | 1.57(1.22-2.01) |
| *P*interaction<0.001 |  |  |  |  |  |  |
| Chemotherapy |  |  |  |  |  |  |
| Yes | 1,219 | 1[Reference] | 970 | 1[Reference] | 218 | 1[Reference] |
| No/Unknown | 1,004 | 1.46(1.32-1.63) | 392 | 2.76(2.35-3.24) | 482 | 2.60(2.12-3.17) |
| *P*interaction<0.001 |  |  |  |  |  |  |

NOTE. HER2, human epidermal growth factor receptor 2; HR, hormone receptor; OR, odds ratio. +Denotes positive; −denotes negative.

aA *P* value <0.05 was considered statistically significant.

bUnknown age and unknown race removed from model owing to nonconvergence (*n* = 1,055).

**Table S6.** Association of Sociodemographic and Clinical Characteristics for Breast Cancer–Specific Mortality Among Patients With Liver Metastases Stratified by HER2 Statusa

|  |  |  |  |
| --- | --- | --- | --- |
| **Variable** | **HER2-** | **HER2+** | **Unknown** |
| **Patients, No.****With Liver Metastases** | **HR(95% CI)** | **Patients, No.****With Liver Metastases** | **HR(95% CI)** | **Patients, No.****With Liver Metastases** | **HR(95% CI)** |
| Age at diagnosis, yb |  |  |  |  |  |  |
| 18-40 | 194 | 1[Reference] | 184 | 1[Reference] | 26 | 1[Reference] |
| 41-60 | 978 | 1.23(0.98-1.54) | 658 | 1.96(1.40-2.74) | 250 | 1.75(0.92-3.32) |
| 61-80 | 853 | 1.77(1.41-2.21) | 440 | 2.99(2.13-4.21) | 315 | 2.18(1.15-4.11) |
| >80 | 198 | 2.49(1.90-3.26) | 80 | 6.60(4.36-10.00) | 109 | 3.25(1.68-6.29) |
| *P*interaction<0.001 |  |  |  |  |  |  |
| Raceb |  |  |  |  |  |  |
| White | 1,444 | 1[Reference] | 856 | 1[Reference] | 473 | 1[Reference] |
| Black | 412 | 1.09(0.94-1.26) | 239 | 1.11(0.89-1.38) | 118 | 1.35(1.06-1.72) |
| Hispanic | 200 | 0.86(0.70-1.05) | 147 | 0.92(0.94-1.22) | 63 | 0.76(0.53-1.08) |
| Asian | 150 | 0.83(0.65-1.06) | 111 | 1.21(0.90-1.64) | 39 | 0.62(0.38-1.01) |
| Other | 17 | 0.84(0.44-1.62) | 9 | 0.79(0.25-2.46) | 7 | 0.32(0.08-1.29) |
| *P*interaction<0.001 |  |  |  |  |  |  |
| Marital status |  |  |  |  |  |  |
| Unmarried | 1,124 | 1[Reference] | 677 | 1[Reference] | 395 | 1[Reference] |
| Married | 955 | 0.72(0.64-0.81) | 601 | 0.75(0.63-0.89) | 256 | 0.80(0.66-0.98) |
| Unknown | 144 | 0.86(0.67-1.10) | 84 | 1.15(0.83-1.59) | 49 | 1.03(0.71-1.48) |
| *P*interaction<0.001 |  |  |  |  |  |  |
| Insurance status |  |  |  |  |  |  |
| Uninsured | 103 | 1[Reference] | 62 | 1[Reference] | 57 | 1[Reference] |
| Insured | 2,075 | 0.52(0.40-0.66) | 1275 | 0.82(0.55-1.23) | 604 | 0.79(0.56-1.11) |
| Unknown | 45 | 0.56(0.36-0.87) | 25 | 0.72(9.33-1.60) | 39 | 0.98(0.60-1.60) |
| *P*interaction<0.001 |  |  |  |  |  |  |
| Tumor size |  |  |  |  |  |  |
| <2.0 cm | 267 | 1[Reference] | 161 | 1[Reference] | 61 | 1[Reference] |
| 2.0-4.9 cm | 765 | 1.06(0.87-1.30) | 505 | 1.19(0.88-1.60) | 165 | 1.71(1.08-2.69) |
| ≥5.0 cm | 702 | 1.31(1.08-1.60) | 420 | 1.37(1.01-1.86) | 144 | 2.21(1.41-3.48) |
| Unknown | 489 | 1.51(1.23-1.85) | 276 | 1.96(1.43-2.67) | 330 | 1.99(1.29-3.05) |
| *P*interaction<0.001 |  |  |  |  |  |  |
| Grade |  |  |  |  |  |  |
| I | 131 | 1[Reference] | 16 | 1[Reference] | 20 | 1[Reference] |
| II | 726 | 1.43(1.07-1.93) | 377 | 1.11(0.49-2.51) | 92 | 0.88(0.47-1.65) |
| III/IV | 949 | 2.10(1.57-2.80) | 752 | 0.97(0.43-2.17) | 144 | 1.13(0.62-2.06) |
| Unknown | 417 | 1.92()1.41-2.60 | 217 | 1.32(0.58-3.02) | 444 | 1.35(0.76-2.40) |
| *P*interaction<0.001 |  |  |  |  |  |  |
| T |  |  |  |  |  |  |
| T1 | 271 | 1[Reference] | 141 | 1[Reference] | 57 | 1[Reference] |
| T2 | 607 | 0.98(0.80-1.20) | 394 | 1.05(0.76-1.43) | 107 | 1.67(1.03-2.72) |
| T3 | 317 | 1.18(0.94-1.47) | 204 | 1.08(0.76-1.54) | 46 | 2.11(1.22-3.66) |
| T4 | 650 | 1.54(1.26-1.87) | 450 | 1.29(0.95-1.75) | 181 | 2.40(1.52-3.77) |
| Unknown | 378 | 1.57(1.27-1.95) | 173 | 2.14(1.53-2.99) | 309 | 2.19(1.41-3.40) |
| *P*interaction<0.001 |  |  |  |  |  |  |
| N |  |  |  |  |  |  |
| N0 | 523 | 1[Reference] | 268 | 1[Reference] | 180 | 1[Reference] |
| N1 | 970 | 0.97(0.84-1.12) | 658 | 0.67(0.54-0.83) | 219 | 1.17(0.90-1.51) |
| N2 | 230 | 0.86(0.70-1.06) | 148 | 0.73(0.54-0.98) | 39 | 1.49(0.99-2.23) |
| N3 | 255 | 1.03(0.85-1.26) | 174 | 0.60(0.44-0.82) | 44 | 1.11(0.72-1.70) |
| Unknown | 245 | 1.13(0.92-1.38) | 114 | 1.37(1.02-1.83) | 218 | 1.26(0.98-1.63) |
| *P*interaction<0.001 |  |  |  |  |  |  |
| Extrahepatic metastatic sites to lung, brain and bone, No. |  |  |  |  |  |  |
| 0/1 | 1,459 | 1[Reference] | 953 | 1[Reference] | 404 | 1[Reference] |
| 2 | 515 | 1.35(1.18-1.54) | 278 | 1.61(1.32-1.96) | 169 | 1.24(0.99-1.55) |
| All 3 | 109 | 1.83(1.43-2.35) | 50 | 2.49(1.72-3.60) | 28 | 1.39(0.84-2.31) |
| Unknown | 140 | 1.24(0.99-1.56) | 81 | 2.22(1.65-3.00) | 99 | 1.26(0.95-1.66) |
| *P*interaction<0.001 |  |  |  |  |  |  |
| Radiation |  |  |  |  |  |  |
| Yes | 591 | 1[Reference] | 358 | 1[Reference] | 105 | 1[Reference] |
| No/Unknown | 1,632 | 1.14(1.00-1.30) | 1,004 | 1.16(0.96-1.40) | 595 | 1.42(1.09-1.85) |
| *P*interaction<0.001 |  |  |  |  |  |  |
| Chemotherapy |  |  |  |  |  |  |
| Yes | 1,219 | 1[Reference] | 970 | 1[Reference] | 218 | 1[Reference] |
| No/Unknown | 1,004 | 1.41(1.26-1.58) | 392 | 2.62(2.21-3.10) | 482 | 2.56(2.04-3.20) |
| *P*interaction<0.001 |  |  |  |  |  |  |

NOTE. HER2, human epidermal growth factor receptor 2; HR, hormone receptor; OR, odds ratio. +Denotes positive; −denotes negative.

aA *P* value <0.05 was considered statistically significant.

bUnknown age and unknown race removed from model owing to nonconvergence (*n* = 1,055).