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Disparities in Breast Cancer Treatment and Survival for Women with Disabilities

Ellen P. McCarthy, PhD, MPH, **Long H. Ngo, PhD**, **Richard G. Roetzheim, MD, MSPH**, **Thomas N. Chirikos, PhD**, **Donglin Li, MD, MPH**, **Reed E. Drews, MD**, and **Lisa I. Iezzoni, MD, MSc**
From Harvard Medical School, Beth Israel Deaconess Medical Center, Boston, Massachusetts, and H. Lee Moffitt Cancer Center & Research Institute, University of South Florida, Tampa, Florida

Abstract

Background—Breast-conserving surgery combined with axillary lymph node dissection and radiotherapy or mastectomy are definitive treatments for women with early-stage breast cancer. Little is known about breast cancer treatment for women with disabilities.

Objective—To compare initial treatment for early-stage breast cancer between women with and without disabilities and to examine the association of treatment differences and survival.

Design—Retrospective cohort study.

Setting—11 Surveillance, Epidemiology, and End Results (SEER) Program tumor registries.

Participants—100 311 women who received a diagnosis of stage I to IIIA breast cancer at 21 to 64 years of age from 1988 to 1999. Women who qualified for Social Security Disability Insurance (SSDI) and Medicare at breast cancer diagnosis were considered disabled.

Measurements—Receipt of breast-conserving surgery versus mastectomy. For women who had breast-conserving surgery (n = 49 166), the authors examined receipt of radiotherapy and axillary lymph node dissection. Survival was measured from diagnosis until death or until 31 December 2001.

Results—Women with SSDI and Medicare coverage had lower rates of breast-conserving surgery than other women (43.2% vs. 49.2%; adjusted relative risk, 0.80 [95% CI, 0.76 to 0.84]). Among

Requests for Single Reprints: Ellen P. McCarthy, PhD, MPH, Division of General Medicine and Primary Care, Department of Medicine, Beth Israel Deaconess Medical Center, Harvard Medical School, 1309 Beacon Street, Suite 220, Brookline, MA 02444; e-mail, emccarth@bidmc.harvard.edu.

Author Contributions: Conception and design: E.P. McCarthy, R.G. Roetzheim, L.I. Iezzoni.
Analysis and interpretation of the data: E.P. McCarthy, L.H. Ngo, R.G. Roetzheim, T.N. Chirikos, D. Li, R.E. Drews, L.I. Iezzoni.
Drafting of the article: E.P. McCarthy, L.I. Iezzoni.
Critical revision of the article for important intellectual content: E.P. McCarthy, R.G. Roetzheim, T.N. Chirikos, R.E. Drews, L.I. Iezzoni.
Final approval of the article: E.P. McCarthy, L.H. Ngo, R.G. Roetzheim, T.N. Chirikos, D. Li, R.E. Drews, L.I. Iezzoni.
Provision of study materials or patients: L.I. Iezzoni.
Statistical expertise: E.P. McCarthy, L.H. Ngo, T.N. Chirikos, D. Li, L.I. Iezzoni.
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Current author addresses and author contributions are available at www.annals.org.

Current Author Addresses: Dr. McCarthy: Division of General Medicine and Primary Care, Department of Medicine, Beth Israel Deaconess Medical Center, Harvard Medical School, 1309 Beacon Street, Suite 220, Brookline, MA 02444.
Drs. Ngo, Li, Drews, and Iezzoni: Beth Israel Deaconess Medical Center, 330 Brookline Avenue, Boston, MA 02215.
Dr. Roetzheim: University of South Florida, 12901 Bruce B. Downs Boulevard, Tampa, FL 33612.
Dr. Chirikos: H. Lee Moffitt Cancer Center & Research Institute, 12902 Magnolia Drive, Tampa, FL 33612.

women who had breast-conserving surgery, women with SSDI and Medicare coverage were less likely than other women to receive radiotherapy (adjusted relative risk, 0.83 [CI, 0.77 to 0.90]) and axillary lymph node dissection (adjusted relative risk, 0.81 [CI, 0.74 to 0.90]). Women with SSDI and Medicare coverage had lower survival rates than those of other women in all-cause mortality (adjusted hazard ratio, 2.02 [CI, 1.88 to 2.16]) and breast cancer–specific mortality (adjusted hazard ratio, 1.31 [CI, 1.18 to 1.45]). Results were similar after adjustment for treatment differences.

Limitations—Findings are limited to women who qualified for SSDI and Medicare. No data on adjuvant chemotherapy and hormonal therapy were available, and details about the underlying disability were lacking.

Conclusions—Women with disabilities had higher breast cancer mortality rates and were less likely to undergo standard therapy after breast-conserving surgery than other women. Differences in treatment did not explain the differences in breast cancer mortality rates.

The 1990 National Institutes of Health (NIH) consensus statement (1) concluded that breast-conserving surgery with adjuvant radiotherapy is an acceptable alternative to mastectomy for most women with early-stage breast cancer. Randomized trials show that breast-conserving surgery with adjuvant radiotherapy is equal to mastectomy in survival and recurrence (2–6). Despite this, studies have repeatedly found that many women with traits that can suggest a social disadvantage—including older age (7–9), minority race or ethnicity (9–14), low socioeconomic status (income or education) (7,14,15), rural residence (8,15), and lack of health insurance (10)—do not receive breast-conserving surgery. Although several factors, including patients' preferences, could explain these disparities, concerns about substandard care persist.

One potentially vulnerable group has received little attention: women with disabilities who develop early-stage breast cancer. For these women, cancer treatment decisions often must consider important factors beyond tumor characteristics. Patients must weigh the clinical implications of their underlying medical conditions for cancer treatments and side effects, as well as very practical questions, such as the potential effect on independent living, performance of daily activities, and use of mobility aids requiring upper body and arm strength and agility. Cancer could complicate patients' perceptions of their physical and emotional well-being that are already tied, in complex ways, to their disabilities (16–20). For physicians, therapeutic decision making must generally rely exclusively on clinical judgment and experience. Because clinical trials often exclude patients with clinically significant functional impairments, almost no scientific evidence is available to guide treatment decisions. Physicians' recommendations may be affected, consciously or unconsciously, by pervasive societal stigmatization of certain disabilities and misperceptions about the patients' actual abilities, quality of life, and preferences for care (21–23).

In this context, we examined breast cancer management for women with disabilities by using the Surveillance, Epidemiology, and End Results (SEER) Program–Medicare database. We believe that our study is the first to investigate treatment and outcomes for women with disabilities who are younger than 65 years of age by using SEER–Medicare data. Previous studies of breast cancer treatment (15,24–26) that used SEER–Medicare data focused exclusively on women 65 years of age or older. In our study, we examined whether initial treatment for early breast cancer differed between women who qualified for Social Security Disability Insurance (SSDI) and Medicare at diagnosis and other women younger than 65 years of age and the extent to which observed differences in breast cancer treatment relate to survival.

Context

We know little about breast cancer treatment for women with disabilities.

Contribution

This large study of 100 311 women younger than 65 years of age with stage I to stage IIIA breast cancer found that women with disabilities had lower rates of breast-conserving surgery and higher all-cause and breast cancer–specific mortality rates than other women. Among those who had breast-conserving surgery, women with disabilities were less likely to receive radiotherapy and axillary lymph node dissection.

Cautions

Disability was defined as meeting the qualifications for Social Security Disability Insurance and Medicare. Details about types and severity of disability and comorbid medical conditions were not available.

—The Editors

Methods

Data Sources

We used the SEER–Medicare data to study women younger than 65 years of age at diagnosis of early-stage breast cancer (defined as stages I to IIIA). The SEER data include 11 population-based tumor registries, representing 14% of the U.S. population (27). The SEER Program collects information on all incident cases of diagnosed cancer within geographically defined areas, including 5 states (Connecticut, Hawaii, Iowa, Utah, and New Mexico) and 6 metropolitan areas (Atlanta, Georgia; Detroit, Michigan; Seattle and Puget Sound, Washington; and San Francisco and Oakland, Los Angeles County, and San Jose and Monterey, California). The latter 2 registries joined SEER in 1992. Data from the 11 SEER registries are linked with Medicare enrollment and utilization information from the Centers for Medicare & Medicaid Services (CMS) for Medicare beneficiaries who received a diagnosis of cancer (27,28).

The SEER registries identify cases primarily by review of hospital pathology reports and discharge diagnoses, and 98% of cases are ascertained. The SEER Program collects information on patient demographic and tumor characteristics at diagnosis, including primary tumor site, stage, size, histology, grade, and hormone receptor status, and ascertains the initial course of treatment, defined as administration within 4 months of diagnosis from 1973 to 1998 and within 12 months of diagnosis after 1998. Ascertainment of surgery and radiation therapy by SEER is generally complete (29,30). However, chemotherapy ascertainment is incomplete and is not released by registries. Vital status is tracked annually, and death certificates are used to determine the underlying cause of death.

As described elsewhere (28), the algorithms used to match SEER and Medicare data are different for Medicare beneficiaries who were younger than 65 years of age and for those who were 65 years of age or older. The match rate for persons 65 years of age or older is 94% (28). The match rate for those younger than 65 years of age is unknown, but it is probably considerably lower because matches on Social Security number are only accepted to minimize false-positive matches (a more stringent standard than that used for older beneficiaries).

We used the SEER public use data file (31) and the Patient Entitlement and Diagnosis Summary file from the SEER–Medicare database, which contains information from the Medicare denominator file (demographic and annual enrollment information through 2001) for Medicare beneficiaries. We used Medicare enrollment dates extracted from the Medicare Enrollment Database to identify women younger than 65 years of age who qualified for SSDI, had Medicare coverage, and were thus disabled at breast cancer diagnosis. We know from aggregate data from the U.S. Social Security Administration that some persons qualify for SSDI because of

disabilities caused by cancer: In 2002, neoplasms caused 9.8% of new disability determinations (32). The U.S. Social Security Administration collects the medical reason for disability determination, but nongovernmental investigators cannot access those data. Therefore, we focused exclusively on women with Medicare at the time of cancer diagnosis. This criterion captures women with preexisting work disability and excludes anyone who is potentially disabled by cancer. Therefore, women must have qualified for SSDI at least 29 months earlier and still be deemed work-disabled at diagnosis (33). To identify our comparison group of women younger than 65 years of age without Medicare, we obtained a crosswalk file between the SEER public use data file and the SEER–Medicare database (33).

Study Sample

We conducted a retrospective cohort study of women 21 to 64 years of age who received a first diagnosis of a pathologically confirmed primary invasive breast cancer between 1 January 1988 and 31 December 1999 and who resided in 1 of the 11 SEER coverage areas. We included women with stage I, II, or IIIA breast cancer, as classified by the American Joint Committee on Cancer (n = 103 163). We excluded women with Paget disease or inflammatory carcinoma (n = 52) and those whose tumor size was classified as widespread (n = 142) or unknown (n = 1771). Because of our interest in initial surgical treatment, we excluded 887 (<1%) of the remaining women because they did not have surgery; 37 of these women had SSDI and Medicare coverage. Our final study sample contains 100 311 women younger than 65 years of age with early-stage breast cancer who received either mastectomy or breast-conserving surgery. A total of 2800 (2.8%) of them had SSDI and Medicare coverage.

Breast Cancer Treatment

Our primary outcome of interest was the initial surgical treatment for early-stage breast cancer, comparing breast-conserving surgery with mastectomy. We defined breast-conserving surgery as segmental mastectomy, lumpectomy, quadrantectomy, tylectomy, wedge resection, nipple resection, excisional biopsy, or partial mastectomy that was not otherwise specified (n = 49 166). We defined mastectomy as subcutaneous, total (simple), modified radical, radical, extended radical mastectomy, or mastectomy that was not otherwise specified (n = 51 145).

For the subset of women who received breast-conserving surgery, we further examined 2 secondary outcomes that may be related to quality of care (34,35). First, we considered receipt of axillary lymph node dissection as recommended by the NIH consensus statement (1). Second, we examined receipt of radiotherapy, which is recommended for women who undergo breast-conserving surgery to reduce the risk for local recurrence (1,36).

Survival

We examined survival (all-cause and breast cancer–related mortality) after diagnosis. We measured survival time as the number of days from diagnosis until death or until 31 December 2001, whichever came first. For all-cause mortality analyses, we censored observations of women who were alive at the end of follow-up (n = 83 293). We also studied breast cancer–specific deaths, classifying deaths from breast cancer or cancer of common metastatic sites (liver, lung, bone, or brain) and censoring observations of women who were alive at the end of follow-up or who died of other causes (n = 88 554). In sensitivity analyses, we restricted cancer deaths only to breast cancer while censoring observations for all other women (n = 89 034).

Statistical Analysis

The institutional review board at our institutions approved the study. We used SAS, version 9.1 (SAS Institute, Cary, North Carolina), for all statistical analyses. We conducted bivariable

analyses to compare demographic and tumor characteristics of our study sample by SSDI and Medicare coverage (disability) status at diagnosis.

We conducted multivariable logistic regression (37) to examine adjusted associations (overall and stage-specific) between breast cancer treatment outcomes and disability status after adjustment for cancer stage at diagnosis (overall models only), age at diagnosis (continuous), race or ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, Asian American or Pacific Islander, or other), marital status at diagnosis (married, widowed, never married, or other), SEER tumor registry, year of diagnosis, tumor size (continuous, in cm), grade (well-differentiated, moderately differentiated, or poorly differentiated or undifferentiated), histology (ductal, lobular, or mixed ductal and lobular), estrogen receptor status (positive, negative, or unknown), and progesterone receptor status (positive, negative, or unknown). In each model, we compare women with and without SSDI and Medicare coverage. We converted odds ratios to relative risks (38) with 95% CIs for each treatment outcome.

We conducted multivariable Cox proportional hazards regression to estimate adjusted relative hazard ratios for each death outcome (all-cause and cancer-specific mortality) (39). We fitted 2 sets of proportional hazards models for each death outcome. The first set of models estimated the *overall* relative hazard ratio comparing women with versus women without SSDI and Medicare coverage. The second set of models estimated the *stage-specific* relative hazard ratio comparing women with versus women without SSDI and Medicare coverage from the interaction between SSDI and Medicare coverage status and cancer stage at diagnosis. For each set, we fitted 3 models. The first model estimated the unadjusted relative hazard ratio comparing women with versus women without SSDI and Medicare coverage. The second model adjusted this relative hazard ratio for age at diagnosis (continuous), race, marital status, tumor registry, year of diagnosis, and cancer stage at diagnosis. The third model further adjusted the relative hazard ratio from model 2 for initial treatment categorized as breast-conserving surgery only, mastectomy only, breast-conserving surgery plus radiotherapy, and mastectomy plus radiotherapy. We present adjusted relative hazard ratios and 95% CIs. An adjusted hazard ratio less than 1.00 indicated longer survival time among SSDI and Medicare beneficiaries relative to other women, and an adjusted hazard ratio greater than 1.00 indicated shorter survival time.

Role of the Funding Source

The National Cancer Institute funded the study (RO1 CA100029). The funding source had no role in the design, analysis, or interpretation of the study or in the decision to submit the manuscript for publication.

Results

On average, women with SSDI and Medicare coverage were 4.4 years older than other women, and 18.4% of women with SSDI and Medicare coverage were non-Hispanic black, compared with 8.7% of other women (Table 1). Women with SSDI and Medicare coverage were much more likely to never have married (26.4% vs. 12.8%). Table 1 also shows various tumor characteristics, including cancer stage at diagnosis, that are available from SEER data. Tumor attributes of women with and women without SSDI and Medicare coverage did not seem to differ, particularly stage at diagnosis, tumor size, and histology.

Across all women with early-stage breast cancer, women with SSDI and Medicare coverage had lower rates of breast-conserving surgery (43.2% vs. 49.2%) (Table 2). After adjustment, women with SSDI and Medicare coverage were less likely to receive breast-conserving surgery (adjusted hazard ratio, 0.80 [95% CI, 0.76 to 0.84]). Most of the observed difference relates to women with earlier disease (stages I and IIA). For women with stage IIB or IIIA disease, the rates of breast-conserving surgery were similar by disability status.

During the study years, axillary lymph node dissection was recommended to identify lymphatic spread that might require adjuvant chemotherapy or additional treatment (as noted later in the Discussion section, sentinel lymph node dissection has recently supplanted axillary lymph node dissection for this purpose). Overall rates of axillary lymph node dissection were lower among women with SSDI and Medicare coverage than among other women (89.7% vs. 97.3%) when the type of surgery was not considered. For women who received mastectomy, few (<4%) had a total (simple) mastectomy, which does not include axillary lymph node dissection. Thus, axillary lymph node dissection rates were higher (97.2%) among women with mastectomy and did not vary by disability status. However, among those who received breast-conserving surgery, women with SSDI and Medicare coverage had axillary lymph node dissection less often than other women even after adjustment (adjusted relative risk, 0.81 [CI, 0.74 to 0.90]) (Table 3).

Consensus standards require that women receiving breast-conserving surgery also undergo adjuvant radiation therapy to reduce the risk for local recurrence and achieve benefits similar to those of mastectomy. Among women who had breast-conserving surgery, those with SSDI and Medicare coverage also received radiotherapy less often than other women even after adjustment (adjusted relative risk, 0.83 [CI, 0.77 to 0.90]) (Table 3).

Women with SSDI and Medicare coverage had shorter survival than other women, both for all-cause and breast cancer–specific mortality (Table 4). Further adjustment for differences in initial treatment did not diminish these disparities. Adjusted hazard ratios for all-cause mortality were highly statistically significant across all cancer stages at diagnosis, with an overall, treatment-adjusted hazard ratio of 1.98 (CI, 1.85 to 2.12). Breast cancer mortality rates were also statistically significantly higher for women with SSDI and Medicare coverage overall, but treatment-adjusted hazard ratios by cancer stage at diagnosis were statistically significant for stages I and IIIA only. For women with stage I cancer at diagnosis, the treatment-adjusted hazard ratio of breast cancer–related death was 1.45 (CI, 1.16 to 1.83). Results of analyses restricting cancer deaths to only breast cancer were similar (data not shown).

Discussion

Women with SSDI and Medicare coverage who received a diagnosis of early-stage breast cancer were less likely than other women to receive breast-conserving surgery. Clinical trials show that breast-conserving surgery and mastectomy have equal survival rates (2,40,41), and therefore, differences in treatment may not affect a woman's prognosis. Both the NIH consensus statement (1) and the current National Comprehensive Cancer Network (NCCN) breast cancer treatment guidelines (42) recommend radiotherapy after breast-conserving surgery for early-stage breast cancer to reduce the rate of locoregional recurrence (1,6,36). We found that women with SSDI and Medicare coverage were less likely than other women to receive radiotherapy and axillary lymph node dissection after breast-conserving surgery. We cannot tell from our data whether the higher rate of breast cancer mortality among women with SSDI and Medicare coverage was associated with increased morbidity from cancer recurrence. However, observed differences in initial breast cancer treatment had little effect on the higher rate. Women with disabilities may be more susceptible to treatment-related complications (such as infections) and toxicities, which may contribute to the higher breast cancer mortality rate. Our findings relate to a special subgroup of work-disabled women with important policy implications—SSDI beneficiaries with Medicare—but may not represent the experiences of other women with disabilities.

Research on breast cancer treatment for women with disabilities is limited, and treatment guidelines are generally based on evidence from trials that excluded patients with poor functional performance. One small single-institution study found that women with physical

disabilities received breast-conserving surgery less often than other women, although these differences were not observed after adjustment for cancer stage (43). A recent study of women treated with breast-conserving surgery at NCCN centers showed that presence of comorbid illness was associated with lower rates of radiotherapy after surgery (44). Another observational study of older women found that women in the lowest quartile of physical functioning were 37% less likely to receive axillary lymph node dissection with breast-conserving surgery than those in the highest functioning quartile (45). Previous studies document treatment differences in breast cancer deaths among women who had breast-conserving surgery for early-stage disease (9,24). Du and colleagues (24) found that failure to undergo either axillary lymph node dissection or radiotherapy after breast-conserving surgery was associated with an increased mortality rate in older women even after adjustment for comorbid illness. Lack of axillary lymph node dissection was associated with lower use of radiotherapy (24) and chemotherapy (45,46), suggesting that complex patterns of care may relate to higher breast cancer mortality rates. Omission of axillary lymph node dissection or radiotherapy could suggest suboptimal care more generally, such as failure to receive hormonal therapy (24).

Treatment choices of women with various disabilities who develop breast cancer are poorly understood. Even without research evidence, clinical judgment suggests that disabling impairments have important implications for initial treatment decisions in early-stage breast cancer. Mastectomy can pose substantial difficulties for women who rely on their arms for mobility in using manual wheelchairs, walkers, or crutches. Extensive axillary lymph node procedures can produce lymphedema and other complications that may compromise upper-extremity function. Even if breast-conserving surgery is preferred, physical impairments could prevent effective radiotherapy. A patient's inability to lie flat, to remain still, or to adequately abduct the arm may pose contraindications to radiotherapy (43).

Beyond the physical implications of women's functional deficits, complex psychosocial and environmental factors—the "subjective illness experience" (47)—substantially affect breast cancer treatment decision making. Women with disabilities often share important perspectives (16), including very practical concerns about daily life, such as the need for extensive advance planning of every logistic aspect of daily activities (17,18). Women with substantial disabilities who develop breast cancer may already confront challenges to independent living, and complications of cancer therapy could disrupt finely tuned adaptations. Finding reliable transportation to complete a 6-week course of radiotherapy may be particularly burdensome for some women with disabilities. If women do not drive, attending daily radiotherapy appointments may not be feasible. One study of elderly women found that anticipating transportation problems increased the likelihood of mastectomy (48). We studied whether women received radiotherapy after breast-conserving surgery, but we could not examine whether they completed the recommended course of treatment. Few data exist on completion rates for radiotherapy after breast-conserving surgery (49,50). One study reported that 96% of women who had radiotherapy after breast-conserving surgery completed the course without interruption (49). Another study reported that 97% of women who had radiotherapy adhered to a standard radio-therapy course of 5 times per week and that adherence did not vary by age, race or ethnicity, or payer (50). Whether women with disabilities have similar completion rates is unknown.

Other research highlights the crucial role of patient–clinician communication in breast cancer treatment choices (51–54). Disability can complicate patient–physician communication (17, 19). Medicare beneficiaries with disabilities report lower satisfaction with communication with their physicians more often than nondisabled persons (55). Some clinicians have openly negative views of disability and make clinical decisions on the basis of these perceptions, justifying their actions by their personal beliefs that patients have poor quality of life (21,22,

56). After reviewing the limited literature on the topic, Basnett (22), a physician who developed quadriplegia after a spinal cord injury, concluded "that for many physicians, the . . . tragic view of disability is reinforced by the end of their training." As a consequence, some argue that disability should join other sociodemographic attributes, such as sex and race or ethnicity, as the focus for "cultural competence education" (22,57).

Our study has important limitations. First, because the SEER public use data file does not include adjuvant chemotherapy, hormonal therapy, or sentinel lymph node dissection, we could not examine the full breadth of treatments. Although SEER began capturing information on sentinel lymph node dissection in 1998, it was not standard care during most of our study years. Recent SEER data show that adoption of sentinel lymph node dissection into routine care for stage I and II tumors has been slow, and it is used much less frequently among women who are elderly or are racial or ethnic minorities (58), which are commonly considered to be vulnerable populations. Second, we lacked information on patients' preferences for treatment, their physicians, and where they received care. Third, our findings may not generalize to persons with disabilities who, for whatever reason, do not apply or qualify for SSDI and Medicare. In particular, they may not reflect experiences of persons receiving only Supplemental Security Income, the income support program for persons with disabilities who are poor and have not paid sufficient payroll taxes to qualify for SSDI. Supplemental Security Income recipients immediately receive Medicaid. Impoverished SSI recipients and low-income or uninsured persons with disabilities who do not have disability benefits face financial barriers to accessing even routine health care (such as mammography screening), which may heighten risks for late-stage cancer diagnoses and shorter survival.

Perhaps most important, knowing the reason for the SSDI disability determination might provide insight into the clinical risks for these patients. To protect beneficiary privacy, the Social Security Administration does not release medical causes of disability determinations to nongovernmental investigators. Aggregate figures for 2002 show that musculoskeletal and connective tissue diseases were the most common reason for SSDI disability determination (27%) among women, followed by mental disorders (other than mental retardation) (26%), neoplasms (10%), and diseases of the nervous system or sensory organs (9%) and circulatory system (8%) (32). Different disabilities clearly carry different implications for cancer experiences. Therefore, the higher mortality rates observed in our study should be interpreted with caution. Some underlying disabling conditions might independently heighten death risks, complicating comparisons of survival experiences between women with and women without disabilities. We explored methods to identify the underlying disabilities from diagnoses coded on health care claims, but this approach has substantial flaws (59,60). Selecting the single disabling condition from several diagnosis codes is difficult. Stable conditions, such as congenital blindness, deafness, and mental retardation, may not require health care services that generate diagnosis codes. For persons receiving services for complications relating to underlying disabilities, clinicians often code the complication, not the disability. Clinicians sometimes withhold potentially stigmatizing diagnoses (such as psychiatric disabilities) when they can code other conditions.

Despite these limitations, our study of SSDI and Medicare beneficiaries raises questions about the quality of breast cancer care for this population of women with disabilities who receive breast-conserving surgery but do not undergo radiotherapy. Breast-conserving surgery without adjuvant radiation is associated with a higher rate of locoregional recurrence and is considered suboptimal treatment for early-stage breast cancer (6,34,35). Future research should focus on potential reasons for lower radiotherapy rates, including the extent to which these disparities reflect patients' preferences for treatment, patient–physician communication, inadequate access, and other barriers to care (such as transportation). In particular, studies should examine

the extent to which underlying disabling conditions preclude women from receiving optimal treatment regimens.

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Table 1

Demographic and Tumor Characteristics by Social Security Disability Insurance and Medicare Status among 100 311 Women with Stage I, II, and IIIA Breast Cancer*

Characteristic	Women with SSDI and Medicare Coverage (*n* = 2800)	Women with Neither SSDI nor Medicare Coverage (*n* = 97 511)
Mean (SD) age, *y*	54.8 (7.5)	50.4 (8.5)
Race or ethnicity		
Non-Hispanic white	68.2	74.9
Non-Hispanic black	18.4	8.7
Asian American or Pacific Islander	3.8	8.3
Hispanic	8.3	7.2
Other	1.0	0.9
Marital status		
Never married	26.4	12.8
Married	35.8	68.0
Widowed	14.1	4.9
Other	23.7	14.2
Tumor registry		
Connecticut	11.6	11.2
Hawaii	3.1	3.8
Iowa	9.8	8.6
New Mexico	4.4	4.4
Utah	3.9	4.0
Atlanta, Georgia	6.6	7.7
Detroit, Michigan	16.2	12.7
Los Angeles, California	16.6	16.8
San Francisco and Oakland, California	12.0	13.5
San Jose and Monterey, California	4.6	4.8
Seattle and Puget Sound, Washington	11.3	12.5
Year of diagnosis		
1988–1991	18.8	22.8
1992–1995	33.5	35.3
1996–1999	47.6	41.9
Tumor stage		
I	50.1	48.3
IIA	29.4	30.4
IIB	15.5	16.6
IIIA	5.0	4.7
Tumor size		
≤1 cm	23.3	23.9
1–2 cm	40.2	39.5
2–5 cm	31.4	31.8
35 cm	5.2	4.8
Lymph nodes		
Negative	57.9	59.7
Positive	31.6	33.8
Unknown	10.5	6.5
Grade		
Well-differentiated	13.8	11.3
Moderately differentiated	31.7	31.3
Poorly differentiated or undifferentiated	32.9	35.7
Histology		
Ductal	78.4	78.7
Lobular	6.2	6.4
Mixed ductal and lobular	5.1	5.9
Estrogen receptor status†		
Positive	53.7	52.8
Negative	20.5	20.5
Progesterone receptor status†		
Positive	46.2	46.6
Negative	25.8	24.6

* Data are reported as percentages, unless otherwise noted. Percentages may not add to 100% because of rounding or missing data. SSDI = Social Security Disability Insurance.

† Data on receptor status were collected only from women who received a diagnosis after 1990.

Table 2

Stage-Specific Surgical Treatment by Social Security Disability Insurance and Medicare Status among Women with Stage I, II, or IIIA Breast Cancer*

Variable	Women with SSDI and Medicare Coverage (*n* = 2800), %	Women with Neither SSDI nor Medicare Coverage (*n* = 97 511), %	Adjusted RR (95% CI) for Women Who Had Breast-Conserving Surgery†
All women (*n* = 100 311)			
Mastectomy	56.8	50.8	1.00
Breast-conserving surgery	43.2	49.2	0.80 (0.76–0.84)
Stage I (*n* = 48 537)			
Mastectomy	45.7	38.2	1.00
Breast-conserving surgery	54.4	61.8	0.76 (0.71–0.82)
Stage IIA (*n* = 30 447)			
Mastectomy	61.5	54.5	1.00
Breast-conserving surgery	38.5	45.4	0.78 (0.69–0.87)
Stage IIB (*n* = 16 591)			
Mastectomy	74.6	71.9	1.00
Breast-conserving surgery	25.4	28.9	0.81 (0.65–1.02)
Stage IIIA (*n* = 4736)			
Mastectomy	85.0	84.3	1.00
Breast-conserving surgery	15.0	15.7	1.01 (0.70–1.46)

* RR = relative risk; SSDI = Social Security Disability Insurance.

† Adjusted for age at diagnosis (continuous), marital status, tumor registry, year of diagnosis, cancer stage at diagnosis, tumor size (continuous), histology, grade, estrogen receptor status, and progesterone receptor status.

Table 3

Receipt of Radiotherapy and Axillary Node Dissection after Breast-Conserving Surgery (n = 49 166) in Women with versus Women without Social Security Disability Insurance and Medicare Coverage*

SSDI and Medicare Status	Radiotherapy			Axillary Lymph Node Dissection		
	Patients, %	Unadjusted RR (95% CI)	Adjusted RR (95% CI)†	Patients,	% Unadjusted RR (95% CI)	Adjusted RR (95% CI) †
Without SSDI and Medicare coverage	81.9	1.00	1.00	89.9	1.00	1.00
With SSDI and Medicare coverage	74.8	0.91 (0.88–0.94)	0.83 (0.77–0.90)	82.1	0.91 (0.89–0.94)	0.81 (0.74–0.90)

*Among women with stage I, II, or IIIA breast cancer who underwent breast-conserving surgery. Model for radiotherapy (n = 47 379; 1787 declined or were missing data on radiotherapy) and model for axillary lymph node dissection (n = 49 152; 14 were missing data on axillary lymph node dissection) are presented. RR = relative risk; SSDI = Social Security Disability Insurance.

†Adjusted for age at diagnosis (continuous), marital status, year of diagnosis, tumor registry, cancer stage at diagnosis, tumor size, grade, histology, estrogen receptor status, and progesterone receptor status.

Table 4

Multivariable Survival Analyses of All-Cause and Breast Cancer–Specific Mortality after Breast Cancer Diagnosis*

Cancer Stage at Diagnosis	Unadjusted HR (95% CI)	Adjusted HR (95% CI)†	Treatment-Adjusted HR (95% CI)†‡
All-cause mortality			
Overall	2.29 (2.14–2.45)	2.02 (1.88–2.16)	1.98 (1.85–2.12)
Stage I	3.16 (2.83–3.54)	2.87 (2.56–3.22)	2.84 (2.53–3.18)
Stage IIA	2.42 (2.16–2.72)	2.04 (1.82–2.29)	2.02 (1.80–2.27)
Stage IIB	1.70 (1.47–1.95)	1.41 (1.22–1.62)	1.39 (1.21–1.61)
Stage IIIA	2.02 (1.63–2.50)	1.70 (1.38–2.11)	1.68 (1.36–2.07)
Breast cancer–specific mortality§			
Overall	1.32 (1.20–1.47)	1.31 (1.18–1.45)	1.29 (1.16–1.43)
Stage I	1.44 (1.14–1.80)	1.47 (1.17–1.85)	1.45 (1.16–1.83)
Stage IIA	1.27 (1.05–1.52)	1.20 (1.00–1.44)	1.19 (0.99–1.43)‖
Stage IIB	1.23 (1.02–1.47)	1.14 (0.95–1.37)‖	1.12 (0.93–1.35)‖
Stage IIIA	1.89 (1.50–2.39)	1.77 (1.40–2.24)	1.74 (1.37–2.20)

*HR = hazard ratio.

†Adjusted HRs <1.00 and >1.00 indicate longer survival time and shorter survival time, respectively, among women with than among women without Social Security Disability Insurance (SSDI) and Medicare coverage. With proportional hazards regression, adjusted HRs are adjusted for age at diagnosis (continuous), race, marital status at diagnosis, Surveillance, Epidemiology, and End Results (SEER) tumor registry, and year of diagnosis (column 2) and are further adjusted for treatment (column 3). Stage-specific adjusted HRs are derived from the interaction between stage and SSDI and Medicare coverage status.

‡Treatment was categorized as breast-conserving surgery only, mastectomy only, breast-conserving surgery plus radiotherapy, and mastectomy plus radiotherapy.

§Includes deaths attributable to breast cancer and common metastatic sites (liver, lung, bone, or brain).

‖Non–statistically significant ($P > 0.05$).