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Cancer Stage at Diagnosis and Survival among Persons with Social Security Disability Insurance on Medicare

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Objective. To examine stage at diagnosis and survival for disabled Medicare beneficiaries diagnosed with cancer under age 65 and compare their experiences with those of other persons diagnosed under age 65.

Data Sources. Surveillance, Epidemiology, and End Results (SEER) Program data and SEER-Medicare linked data for 1988–1999. SEER-11 Program includes 11 population-based tumor registries collecting information on all incident cancers in catchment areas. Tumor registry and Medicare data are linked for persons enrolled in Medicare.

Study Design. 307,595 incident cases of non-small cell lung (51,963), colorectal (52,092), breast (142,281), and prostate (61,259) cancer diagnosed in persons under age 65 from 1988 to 1999. Persons who qualified for Social Security Disability Insurance and had Medicare (SSDI/Medicare) were identified from Medicare enrollment files. Ordinal polychotomous logistic regression and Cox proportional hazards regression were used to estimate adjusted associations between disability status and later-stage diagnoses and mortality (all-cause and cancer-specific).

Principal Findings. Persons with SSDI/Medicare had lower rates of Stages III/IV diagnoses than others for lung (63.3 versus 69.5 percent) and prostate (25.5 versus 30.8 percent) cancers, but not for breast or colorectal cancers. After adjustment, they remained less likely to be diagnosed at later stages for lung and prostate cancers. Nevertheless, persons with SSDI/Medicare experienced higher all-cause mortality for each cancer. Cancer-specific mortality was higher among persons with SSDI/Medicare for breast and colorectal cancer patients.

Conclusions. Disabled Medicare beneficiaries are diagnosed with cancer at similar or earlier stages than others. However, they experience higher rates of cancer-related mortality when diagnosed at the same stage of breast and colorectal cancer.

Key Words. Disability, disparities, stage of cancer, cancer survival, SSDI, SEER–Medicare

Populations with attributes marking social disadvantage in the United States—such as persons living in poverty and racial and ethnic minorities—often experience worse outcomes than others when diagnosed with cancer. They frequently have later-stage cancer diagnoses, less intensive or appropriate therapies, and shorter survivals than persons with greater social advantages (Haynes and Smedley 1999). In recent years, such observations have prompted nationwide efforts to track and eliminate disparities in health-related experiences of vulnerable populations. To date, much of the public focus on health disparities has targeted racial and ethnic minorities. However, *Healthy People 2010*, which set national health priorities, warns that persons with disabilities might also receive substandard health care. Noting well-documented disparities in their use of screening and preventive services (Nosek and Howland 1997; Chan et al. 1999; Iezzoni et al. 2000, 2001), *Healthy People 2010* cautions that "as a potentially underserved group, people with disabilities would be expected to experience disadvantages in health and well-being compared with the general population" (Department of Health and Human Services 2000). In a July 2005 "Call to Action," the United States Surgeon General states that persons with disabilities sometimes lack equal access to care and encourages the inclusion of persons with disabilities in studies concerning disparities in health care access and outcomes (U.S. Department of Health and Human Services 2005).

Exploring whether persons with disabilities do, in fact, experience worse cancer-related outcomes is complicated by the lack of information on disability in data sources typically used to conduct disparities research concerning cancer. Data from the Surveillance, Epidemiology, and End Results (SEER) cancer registries have produced important insights into racial and ethnic

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disparities (Klabunde et al. 1998; McCarthy et al. 1998; Bach et al. 1999; Ngo-Metzger et al. 2003; Jemal et al. 2004; Zeliadt et al. 2004; Shavers, Brown, Klabunde et al. 2004; Shavers, Brown, Potosky et al. 2004; Steyerberg et al. 2005). SEER data merged with Medicare claims have yielded additional findings about outcomes, treatments, and health care costs for Medicare beneficiaries with cancer (Potosky et al. 1993; Warren et al. 2002). Neither SEER nor Medicare data contain indicators of patients' functional status. However, one potential approach to investigate an important subpopulation of people with disabilities involves focusing on persons receiving Social Security Disability Insurance (SSDI) who eventually become eligible for Medicare.

Persons with SSDI are presumably too medically disabled to work (an employability-based definition of disability). To qualify, persons must convince the Social Security Administration (SSA) that they cannot engage in "substantial gainful activity" because of medically proven sensory, physical, cognitive, or emotional impairments (Social Security Administration 2003a). Five months after qualifying for SSDI, they start receiving monthly cash payments, although many find their annual incomes plummet—posing another social disadvantage (Martin and Davies 2003/2004). Twenty-four months after first receiving cash benefits, SSDI beneficiaries become eligible for Medicare. In 2004, Medicare covered 6.4 million SSDI recipients under age 65 among its estimated 41.7 million beneficiaries (Centers for Medicare and Medicaid Services 2003).

Prior studies using merged SEER–Medicare data have exclusively considered Medicare beneficiaries age 65 and older. Our study is the first to use these data to examine cancer experiences of Medicare beneficiaries *under age 65.* We examined stage at diagnosis and survival for disabled Medicare beneficiaries diagnosed with non-small cell lung, colorectal, female breast, or prostate cancers and compared their experiences with those of persons diagnosed in this same age group who do not have SSDI/Medicare. Because in previous studies we found that persons with certain types of disabilities (e.g., physical disabilities) are less likely to receive cancer screening and preventive services (Iezzoni et al. 2000, 2001), we hypothesized that disabled Medicare beneficiaries would have delayed cancer diagnosis compared with others diagnosed under age 65.

METHODS

Data Sources

When SEER and Medicare data were linked, the SEER Program included 11 population-based tumor registries, representing 14 percent of the United

States population (Warren et al. 2002). SEER collects limited demographic characteristics, as well as information on tumor characteristics at diagnosis and initial surgical and radiation treatment for all incident cases of cancer diagnosed within geographically defined areas. Registries are located in five states (Connecticut, Hawaii, Iowa, Utah, New Mexico) and six metropolitan areas (Atlanta, Detroit, San Francisco/Oakland, Seattle/Puget Sound, Los Angeles county, San Jose/Monterey). SEER added the latter two registries in 1992. Data from the SEER-11 registries are linked with Medicare enrollment and utilization information from the Centers for Medicare and Medicaid Services (CMS) for Medicare beneficiaries diagnosed with cancer (Potosky et al. 1993; Warren et al. 2002).

As described elsewhere, SEER and Medicare data match for 94 percent of persons age 65 and older (Potosky et al. 1993). Match rates are unknown for Medicare beneficiaries under age 65 but are probably considerably lower. To avoid possible false-positive matches, only social security number-based matches are accepted for persons under age 65—a more stringent standard than for older beneficiaries (J. Warren, Ph.D., National Cancer Institute, personal communication).

We identified cases diagnosed with non-small cell lung, colorectal, female breast, or prostate cancer under age 65 years in the SEER-11 registries using two files: (1) Patient Entitlement and Diagnosis Summary file (PEDSF) from SEER–Medicare, and (2) SEER Public Use file (SEER PUF; National Cancer Institute 2004). First, we used the SEER–Medicare PEDSF, which consists of Medicare beneficiaries residing in the SEER areas who were diagnosed with cancer. The PEDSF file combines cancer information collected by the SEER Program with Medicare entitlement information and annual enrollment data spanning from 1986 to 2001. We then obtained effective dates of Medicare enrollment from the Medicare Enrollment Database to identify our study group consisting of persons under age 65 who qualified for SSDI and were on Medicare *before* their cancer diagnosis (i.e., SSDI/Medicare). Therefore, we focused exclusively on the subset of persons with disabilities who are known to have had Medicare at the time of their cancer diagnosis. This means that beneficiaries must have qualified for SSDI at least 29 months earlier (for noncancer-related causes of disability) and were deemed still to be work disabled at the time of their cancer diagnosis. Next we used the SEER PUF to identify our comparison group consisting of persons diagnosed with cancer under age 65 who did *not* qualify for Medicare. Because the SEER PUF includes all cancer cases diagnosed in the SEER-11 areas (including the subset in SEER–Medicare) and has encrypted unique identifiers, we obtained a

crosswalk file between the SEER PUF and SEER–Medicare to eliminate SSDI/Medicare cases from SEER PUF. We then combined the cases with SSDI/Medicare (identified from SEER–Medicare) with the comparison group (identified from SEER PUF) to apply our study selection criteria.

Study Sample

We first identified adults under age 65 when diagnosed with their first primary cancer between January 1, 1988 and December 31, 1999, residing in SEER's 11 coverage areas. We excluded cases that were diagnosed on autopsy or by death certificate ($n = 264$); those with a missing date of diagnosis ($n = 290$); those qualifying for Medicare because of end-stage renal disease ($n = 1{,}084$); and those with SSDI qualifying for Medicare within 28 months following their cancer diagnosis ($n = 4{,}296$) as these individuals had a disabling condition, but did not qualify for Medicare until shortly after their cancer diagnosis. We further worried that people with SSDI Medicare eligibility may have been less likely than others to have tissue diagnoses, such as through biopsies. Confirmation rates varied by cancer; less than 0.5 percent of colorectal, breast, and prostate cancers lacked pathologic confirmation whereas 2 percent of non-small cell lung cancer cases were unconfirmed. For lung cancer, persons with SSDI/Medicare lacked confirmation more often than others (6 versus 1 percent, respectively). To retain the most clinically homogeneous population possible, we excluded the 1,586 cases whose diagnoses were not pathologically confirmed. Finally, because individuals must be age 22 or older and have waited at least 29 months to qualify for SSDI/Medicare, we further excluded 209 cases aged 21–23 when diagnosed with cancer. This yielded a study sample of 307,595 persons aged 24–64 when diagnosed with non-small cell lung (51,963), colorectal (52,092), female breast (142,281), or prostate (61,259) cancer.

Cancer Outcome Measures

We had three primary outcomes of interest: stage at diagnosis, all-cause mortality, and cancer-specific mortality. We measured cancer stage at diagnosis using the American Joint Committee on Cancer's staging system. We measured survival following diagnosis and examined both all-cause mortality and cancer-specific mortality; survival analyses excluded persons diagnosed with carcinoma in situ (4,606 colorectal, 23,225 breast, and 1,357 prostate cancers). We measured survival time as the days from date of diagnosis until death or December 31, 2001, whichever came first. We excluded an additional 880

persons with missing or negative survival times as the latter could not be reconciled. For all-cause mortality analyses, we treated data of persons alive at the end of follow-up as censored observations. For cancer-specific mortality analyses, we classified cancer-specific deaths using underlying cause of death from death certificates, and we treated data of persons who were alive on December 31, 2001 or who died from noncancer causes as censored observations.

Statistical Analysis

The institutional review board at our institutions approved this study. All statistical analyses used *SAS* version 9.1 (SAS Institute, Cary, NC). We conducted bivariable analyses to describe demographic characteristics of the study sample and distribution of stage at diagnosis across our study groups. Because of large sample sizes, we do not present *p*-values for bivariable comparisons as small differences can be highly significant, but may not be clinically meaningful. Instead, we focus on the magnitudes of observed differences.

We conducted multivariable ordinal polychotomous logistic regression (Hosmer and Lemeshow 1989) to examine adjusted associations between later stage at diagnosis and disability status—for each cancer separately—after adjusting for covariates previously shown to be associated with stage, including: sex (lung and colorectal models only); age at diagnosis (continuous); race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, Asian American/Pacific Islander, other); marital status at diagnosis (married, widowed, never married, other); geographic location using SEER tumor registry; and year of diagnosis. In each model, we compare persons on SSDI/Medicare with other persons. We excluded persons with unstaged cancers from our polychotomous logistic models. We present the adjusted odds ratios (aORs) and 95 percent confidence intervals (CIs) for later-stage disease.

We conducted survival analyses using multivariable Cox proportional hazards regression to estimate adjusted relative hazard ratios for each outcome (all-cause and cancer-specific mortality; Lee 1992). As above, we examined each cancer separately, and we fit two proportional hazards models for each mortality outcome. The first model estimated the *overall* relative hazard ratio comparing persons with versus without SSDI/Medicare, with models adjusting for covariates previously shown to be associated with survival: including sex (lung and colorectal models only), age at diagnosis (continuous), race/ethnicity, marital status, geographic location using SEER tumor registry, year of diagnosis, and stage at diagnosis. The second model estimated the *stage-specific* relative hazard ratio comparing persons with versus without SSDI/

Medicare from the interaction between SSDI/Medicare status and stage at diagnosis. We present adjusted relative hazard ratios (aHR) and 95 percent CI: aHR < 1.00 indicates longer survival time among SSDI/Medicare beneficiaries relative to other persons and aHR > 1.00 indicates shorter survival time.

RESULTS

Table 1 presents selected demographic characteristics at the time of diagnosis for the four cancers. The proportion of cases with SSDI/Medicare varied across cancers from 2.7 percent for breast cancer to 8.9 percent for non-small cell lung cancer. Persons with SSDI/Medicare were, on average, several years older; among lung and colorectal cancer patients, persons with SSDI/Medicare were much more likely to be male than those without SSDI/Medicare. For all cancers, proportions with non-Hispanic black race were considerably higher among persons with versus without SSDI/Medicare. Persons with SSDI/Medicare were also much less likely to have ever married than those without SSDI/Medicare.

Table 2 shows stage at diagnosis across the four cancers. For persons diagnosed with lung cancer, individuals with versus without SSDI/Medicare had higher rates of Stage I diagnoses (22.0 versus 17.8 percent) and lower rates of Stage IV diagnoses (34.6 versus 42.1 percent). Although prostate cancers were diagnosed at somewhat earlier stages for men with SSDI/Medicare, stage at diagnosis was similar by SSDI/Medicare status for the breast and colorectal cancers. The aORs for later-stage diagnoses confirmed these findings (Table 3). For lung and prostate cancers, persons with SSDI/Medicare remained significantly less likely to be diagnosed with later-stage disease after adjustment.

Table 4 presents the adjusted associations between SSDI/Medicare status and each mortality outcome. In general, persons with SSDI/Medicare had substantially higher overall and stage-specific mortality rates from all causes than persons without SSDI/Medicare. However, overall cancer-specific mortality was substantially higher for persons with SSDI/Medicare for only breast and colorectal cancer patients. Cancer-specific mortality rates were also higher among patients with SSDI/Medicare for Stage I lung cancer, Stages II and III colorectal cancer, and Stages I, III, and IV breast cancer.

DISCUSSION

Our analyses explored cancer diagnoses and mortality among a very specific albeit policy-relevant subpopulation of persons with disabilities—individuals

Table 1: Selected Demographic Characteristics by SSDI Entitlement to Medicare among Persons Diagnosed with Cancer Age 24–64 Years

	*With SSDI/Medicare**	*Without SSDI/Medicare*
Lung	*n* = 4,626	*n* = 47,337
Mean age (SD)	58.0 years (5.6)	55.6 years (7.0)
Female (%)	27.4	40.3
Race/ethnicity (%)		
Non-Hispanic white	71.0	73.5
Non-Hispanic black	22.4	15.1
Asian American/Pacific Islander	2.0	6.7
Hispanic	4.1	4.1
Other	0.5	0.6
Marital status (%)		
Never married	18.2	13.7
Married	48.4	61.5
Widowed	9.0	6.1
Other	24.4	18.7
Colorectal	*n* = 2,723	*n* = 49,369
Mean age (SD)	57.4 years (6.7)	54.0 years (8.4)
Female (%)	34.3	43.6
Race/ethnicity (%)		
Non-Hispanic white	66.3	70.4
Non-Hispanic black	19.9	11.5
Asian American/Pacific Islander	4.0	9.6
Hispanic	9.0	7.3
Other	0.8	1.2
Marital status (%)		
Never married	23.9	12.7
Married	47.1	68.8
Widowed	9.1	4.6
Other	20.0	13.9
Breast	*n* = 3,911	*n* = 138,476
Mean age (SD)	54.7 years (7.6)	50.4 years (8.6)
Race/ethnicity (%)		
Non-Hispanic white	67.6	74.3
Non-Hispanic black	19.7	9.2
Asian American/Pacific Islander	3.6	8.2
Hispanic	8.0	7.2
Other	1.2	1.2
Marital status (%)		
Never married	27.7	13.2
Married	34.7	66.9
Widowed	13.7	4.9
Other	23.9	15.0

Continued

Table 1: *Continued*

	*With SSDI/Medicare**	*Without SSDI/Medicare*
Prostate	$n = 3,811$	$n = 57,448$
Mean age (SD)	60.0 years (4.0)	58.4 years (4.8)
Race/ethnicity (%)		
Non-Hispanic white	57.3	74.8
Non-Hispanic black	29.0	14.3
Asian American/Pacific Islander	2.1	3.2
Hispanic	9.8	5.7
Other	1.9	2.0
Marital status (%)		
Never married	14.4	8.9
Married	61.6	75.9
Widowed	3.2	1.9
Other	20.7	13.3

Total number of cases is: lung ($n = 51,963$), colorectal ($n = 52,092$), breast ($n = 142,281$), and prostate ($n = 61,259$).

*Cases on Medicare at time of cancer diagnosis and who qualified for Medicare via SSDI.

SSDI, Social Security Disability Insurance.

under age 65 who qualify for Medicare through SSDI eligibility. We detected no evidence of later-stage cancer diagnoses among persons with disabilities, finding just the opposite for patients with lung and prostate cancer. Although persons with disabilities had substantially higher all-cause mortality for each cancer, patients with breast and colorectal cancers also experienced higher rates of cancer-specific mortality. Importantly for patients with breast and colorectal cancer, persons with SSDI/Medicare had similar "intermediate" outcomes (i.e., were diagnosed at similar stages) as those without SSDI and Medicare; this subpopulation of persons with disabilities nonetheless had significantly worse ultimate outcomes—shorter cancer-related survival.

Upon reflection, these findings make clinical and practical sense. One might expect that persons with disabilities would have later-stage diagnoses based on nationally representative studies showing lower rates of cancer screening among persons with certain, albeit not all, types of disabilities (Chan et al. 1999; Iezzoni et al. 2000, 2001). Several factors could explain the opposite finding in our study. Unlike persons under age 65 without Medicare who may have inadequate health insurance or be uninsured, all persons with SSDI/Medicare *have* health insurance coverage. To obtain SSDI, they must have medically determinable health conditions that prevent them from working. They are also likely to require periodic medical care and may have more

Table 2: Cancer Stage at Diagnosis by SSDI Entitlement to Medicare among Persons Diagnosed with Cancer Age 24–64 Years

	With SSDI/Medicare (%)*	*Without SSDI/Medicare (%)*
Lung	$n = 4{,}626$	$n = 47{,}337$
I	22.0	17.8
II	4.6	4.7
IIIA	11.3	10.4
IIIB	17.4	17.0
IV	34.6	42.1
Unstaged	10.2	8.0
Colorectal	$n = 2{,}723$	$n = 49{,}369$
In situ	8.6	8.9
I	23.8	22.2
II	21.9	22.7
III	21.7	23.6
IV	20.2	18.8
Unstaged	3.9	3.8
Breast	$n = 3{,}911$	$n = 138{,}370$
In situ	14.1	16.4
I	36.3	34.3
IIA	21.5	21.6
IIB	11.2	11.9
II NOS	0.8	1.2
IIIA	3.7	3.5
IIIB	3.6	2.4
IV	4.0	3.4
Unstaged	4.9	5.3
Prostate	$n = 3{,}811$	$n = 57{,}448$
In situ	3.7	2.1
I	21.4	18.7
II	11.9	12.9
III	15.0	20.5
IV	10.5	10.3
Unstaged	37.5	35.5

Total number of cases is: lung ($n = 51{,}963$), colorectal ($n = 52{,}092$), breast ($n = 142{,}281$), and prostate ($n = 61{,}259$).

*Cases on Medicare at time of cancer diagnosis and who qualified for Medicare via SSDI.

SSDI, Social Security Disability Insurance.

interactions with and access to clinicians and closer clinical monitoring than other persons under age 65 who, before their cancer diagnoses, may have had fewer reasons or opportunities to seek care. Persons with physical disabilities that compromise their pulmonary status may have more frequent radiographs of their lungs, which could detect early lung cancers; those with conditions affecting their urinary tracts could have urinary symptoms evaluated more

Table 3: Adjusted* ORs for Later Stage Disease Comparing Persons with and without SSDI Entitlement to Medicare among Cases Diagnosed with Cancer Age 24–64 Years

Cancer	*Comparing Persons with and without SSDI Entitlement to Medicare Adjusted OR (95% CI)*
Lung	0.76 (0.72, 0.81)
Colorectal	0.96 (0.89, 1.04)
Breast	1.02 (0.95, 1.09)
Prostate	0.83 (0.77, 0.90)

*All odds ratios adjusted for age at diagnosis (continuous), race/ethnicity, marital status at diagnosis, geographic location (i.e., SEER tumor registry), and year of diagnosis using polychotomous logistic regression. Models for lung and colorectal cancer also adjusted for sex. Adjusted odds ratios (aORs) >1.00 indicate later stage at diagnosis among people with SSDI/Medicare entitlement compared with those without SSDI/Medicare entitlement.

CI, confidence interval; SEER, Surveillance, Epidemiology, and End Results.

closely, thus identifying prostate cancers earlier. As insurance coverage and prediagnosis health care service utilization are not available in SEER for persons without Medicare, we cannot test this hypothesis.

Our findings relating to all-cause mortality were not surprising, with persons with disabilities experiencing substantially shorter survival for all four cancers. Some decrement in longevity may relate inevitably to complex medical conditions underlying certain disabilities, compounded by the side effects and stresses of cancer treatments. Higher cancer-related mortality for breast and colorectal cancers does require some explanation, especially given similar stage at diagnosis. Having SSDI suggests that persons might have complex underlying medical conditions that heighten the risk of dying from cancer. One potential explanation may relate to different treatment regimens. Yet, little is known about how persons with various disabilities who develop cancer make treatment choices. The evidence base for making treatment decisions for cancer patients with coexisting physical disabilities is extremely thin because persons with impaired physical functioning may be excluded from many cancer treatment trials based on performance status (Loprinzi et al. 1994; Maltoni et al. 1995). Disabling conditions may also complicate cancer treatments, especially extensive surgery and chemotherapy with potentially dangerous side effects. Treatment choices may be limited for some patients with disabilities due to very practical concerns about daily life (Iezzoni 2003b; Iezzoni and O'Day 2006). For example, transportation to complete a course of radiotherapy poses additional challenges to patients with cancer and may be particularly

Table 4: Multivariable Survival Analyses* of All-Cause and Cancer-Specific Mortality following Cancer Diagnosis Comparing Persons with and without SSDI Entitlement to Medicare among Cases Diagnosed with Cancer Age 24–64 Years

		Comparing Persons with and without SSDI Entitlement to Medicare	
Cancer	*Stage at Diagnosis*	*All-Cause Mortality*	*Cancer-Specific Mortality*
Lung	Overall	**1.10 (1.06, 1.14)**	1.03 (0.99, 1.07)
	Stage I	**1.46 (1.36, 1.58)**	**1.24 (1.12, 1.37)**
	Stage II	**1.22 (1.05, 1.42)**	1.12 (0.93, 1.34)
	Stage III	**1.11 (1.05, 1.18)**	1.06 (0.99, 1.13)
	Stage IV	0.98 (0.93, 1.03)	0.97 (0.92, 1.03)
	Unstaged	1.02 (0.92, 1.13)	0.94 (0.84, 1.05)
Colorectal	Overall	**1.44 (1.36, 1.51)**	**1.11 (1.04, 1.19)**
	Stage I	**2.76 (2.42, 3.14)**	1.16 (0.85, 1.59)
	Stage II	**1.82 (1.62, 2.04)**	**1.21 (1.01, 1.45)**
	Stage III	**1.37 (1.24, 1.52)**	**1.16 (1.02, 1.32)**
	Stage IV	1.05 (0.96, 1.15)	1.04 (0.94, 1.14)
	Unstaged	**1.64 (1.30, 2.07)**	1.24 (0.91, 1.70)
Breast	Overall	**1.81 (1.71, 1.91)**	**1.28 (1.18, 1.39)**
	Stage I	**2.81 (2.51, 3.14)**	**1.35 (1.06, 1.72)**
	Stage II	**1.71 (1.57, 1.87)**	1.09 (0.95, 1.24)
	Stage III	**1.58 (1.36, 1.82)**	**1.68 (1.43, 1.97)**
	Stage IV	**1.39 (1.18, 1.65)**	**1.46 (1.21, 1.76)**
	Unstaged	**1.43 (1.14, 1.79)**	0.93 (0.66, 1.32)
Prostate	Overall	**1.97 (1.85, 2.08)**	1.10 (0.98, 1.24)
	Stage I	**3.02 (2.65, 3.45)**	1.37 (0.91, 2.05)
	Stage II	**2.44 (2.03, 2.92)**	1.32 (0.78, 2.24)
	Stage III	**1.88 (1.61, 2.21)**	1.37 (0.99, 1.88)
	Stage IV	**1.25 (1.10, 1.41)**	1.06 (0.91, 1.23)
	Unstaged	**2.19 (1.99, 2.42)**	0.99 (0.76, 1.27)

Estimates in bold are significant at $p < .05$.

*Adjusted hazard ratios (aHR) < 1.00 indicate longer survival time among people with SSDI entitlement to Medicare compared with those without Medicare entitlement and aHR > 1.00 indicates shorter survival time. All aHRs are adjusted for age at diagnosis (continuous), race/ethnicity, marital status at diagnosis, geographic location (i.e., SEER tumor registry), and year of diagnosis using proportional hazards regression. Stage-specific aHRs are derived from the interaction between stage and SSDI status. Models for lung and colorectal cancer also adjusted for sex.

SSDI, Social Security Disability Insurance; SEER, Surveillance, Epidemiology, and End Results.

burdensome or even infeasible for some patients with disabilities. In subsequent work by our group, we have explored whether differences in treatment might explain shorter survival for women with early stage breast cancer. We did find disparities in treatment between women with and without SSDI/Medicare, but those treatment differences did not explain the higher rate of cancer mortality observed among women with SSDI/Medicare (data not shown).

This study has important limitations. First, we relied upon a specific administrative definition of disability (i.e., SSDI recipients who qualify for Medicare). Although SSDI beneficiaries are supposed to be periodically re-evaluated to ensure they remain work disabled, it is possible that some SSDI/Medicare beneficiaries may no longer be disabled. Second, our comparison group is heterogeneous and likely contains persons with disabling conditions who for some reason do not apply for federal assistance or do not qualify for SSDI and Medicare. For example, it may include persons with disabilities who continue to work possibly because they want to or because their employers can make adequate accommodations enabling them to remain in the workforce. It may also include persons with disabilities that are not severe enough to meet the employment-based disability criteria of SSDI. Furthermore, we cannot identify persons with Supplemental Security Income (SSI), although they would comprise only a small fraction of the comparison group. Nationwide, an estimated 2.4 percent of persons aged 18–64 received SSI in 2003; for example, only 1.5 percent of the state of Connecticut's (a SEER area) residents in this age group received SSI. In addition, the comparison group includes a small fraction of individuals who qualified for SSDI/Medicare more than 29 months after their cancer diagnosis. We know from SSA aggregate data that some fraction of persons qualify for SSDI because of cancer-related impairments (in 2002, neoplasms caused 9.8 percent of new disability determinations; Social Security Administration 2003b). However, it is not possible to determine from our data whether these individuals qualified for SSDI/Medicare because of cancer-related impairments or whether cancer exacerbated a preexisting condition making them eligible for SSDI and Medicare. Finally, our results may not generalize to persons with disabilities who do not receive SSDI and Medicare. In particular, our results may not reflect experiences of persons receiving only SSI, the income support program for persons with disabilities who are poor or have not paid sufficient payroll taxes; SSI recipients immediately receive Medicaid. Impoverished SSI recipients and low income or uninsured persons with disabilities who have not yet applied to SSA for disability benefits may face particular barriers to accessing health care, both for monitoring their health conditions and for screening procedures.

Moreover, studying SSDI/Medicare beneficiaries poses significant challenges (Riley, Lubitz, and Zhang 2003). They are very heterogeneous with diverse disabling conditions, including physical, sensory, developmental, and/or psychiatric impairments. Knowing the reason for the SSDI disability determination would have given us more insight into the clinical risks of these patients. To protect beneficiary privacy, the SSA, which keeps records on

medical causes of disability determinations, does not release this information to nongovernmental investigators. Aggregate figures suggest that in 2002, the most common reason for SSDI disability determination was musculoskeletal and connective tissue diseases (25.4 percent), followed by mental disorders (22.3 percent) (other than mental retardation) (Social Security Administration 2003b). Clearly, different disabilities carry different implications for cancer experiences. We explored methods using diagnosis codes from Medicare claims to identify underlying disabilities, but this approach has substantial flaws (Iezzoni 2002, 2003a). Selecting the single disabling condition from numerous diagnosis codes is difficult. Stable conditions, such as congenital blindness, deafness, and mental retardation, may not require health care services and thus generate no diagnosis codes. For persons receiving services for complications relating to underlying disabilities, clinicians often code the complication, not the disability. Sometimes clinicians withhold potentially stigmatizing diagnoses (e.g., psychiatric disabilities) when they can code other conditions.

Focusing on persons with SSDI and Medicare concentrates on a very specific subgroup of disabled individuals, but one with important policy relevance. With the high and rising costs of federal entitlement programs, this population is vulnerable to shifting federal policies relating to the social "safety net." Especially problematic is the 29 total months persons must wait between the date of SSDI disability award and Medicare eligibility. This waiting period is applicable to all SSDI recipients with the exception of those with amyotrophic lateral sclerosis (ALS). The wait was rescinded for persons with ALS because of their grave risks for imminent death. The health-related experiences of SSDI recipients during the waiting period remain largely undocumented. In 2002, an estimated 1.26 million individuals with SSDI were waiting to qualify for Medicare (Dale and Verdier 2003). Approximately one-third lacked health insurance during their wait, while roughly 40 percent had Medicaid (Dale and Verdier 2003). Among those newly receiving SSDI in 1995, 11.8 percent died during the waiting period for Medicare, while 2.1 percent recovered; 61.8 percent of those granted SSDI because of cancer-related disability died, compared with 1.0 percent of those with musculoskeletal disabilities (Riley 2004). Therefore, as for ALS patients, some persons with cancer could potentially benefit substantially by obtaining immediate Medicare eligibility and thus financial access to health care services. Given our data source, we cannot tell whether problems left untreated during the 29-month wait for Medicare might have contributed to shorter survivals.

Our findings support the importance of Medicare coverage for disabled persons with cancer. For whatever reason, persons with SSDI/Medicare are

diagnosed with these four cancers at similar or earlier stages than other individuals. Our findings are consistent with those of Caban et al. (2002), who found that women with disabilities were diagnosed with breast cancer at similar stages than women without disabilities. However, studies suggest that physicians may not fully address wellness topics with some patients with disabilities (Chan et al. 1999; Iezzoni et al. 2000, 2001). Previously, we found that women with significant mobility difficulties were 30 percent less likely than other women to receive screening mammograms (Iezzoni et al. 2000). Because our study did not examine cancer outcomes for specific disabling conditions, our findings should not negate efforts, such as those spearheaded by *Healthy People 2010* (U.S. Department of Health and Human Services 2000), to increase rates of cancer screening, which should be part of broader efforts to encourage healthy lifestyles and maximize wellness for all persons.

To our knowledge, this is the first study to report cancer outcomes for SSDI/Medicare beneficiaries under age 65 diagnosed with the four most common cancers. Our findings highlight important areas requiring further inquiry. Further research is needed to understand the mechanisms underlying differences in cancer mortality. Future studies should better understand treatment decisions and examine the extent to which treatment differences explain higher mortality rates of disabled persons, particularly among those with Stage I lung cancer, early-stage breast and colorectal cancer, and advanced-stage colorectal cancer. More information is needed to understand how cancer outcomes vary across different disabling conditions and explore how these variations relate to the underlying disabling condition, patient preferences for care, physician practice patterns, and health system characteristics. Identification of subgroups with disabilities that are susceptible to worse outcomes will inform the development of targeted interventions at SSDI beneficiaries at greatest risk for disparities in detection or treatment. Nowadays, as persons with significant disabilities are living into their seventh decade and beyond, many more persons with substantial physical and sensory impairments will present with cancer. Developing ways to improve their survival and quality of life with cancer will therefore become increasingly pressing.

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