Other

Breast Cancer and Women's Labor Supply

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Objective. To investigate the effect of breast cancer on women's labor supply.

Date Source/Study Setting. Using the 1992 Health and Retirement Study, we estimate the probability of working using probit regression and then, for women who are employed, we estimate regressions for average weekly hours worked using ordinary least squares (OLS). We control for health status by using responses to perceived health status and comorbidities. For a sample of married women, we control for spouses' employer-based health insurance. We also perform additional analyses to detect selection bias in our sample.

Principal Findings. We find that the probability of breast cancer survivors working is 10 percentage points less than that for women without breast cancer. Among women who work, breast cancer survivors work approximately three more hours per week than women who do not have cancer. Results of similar magnitude persist after health status is controlled in the analysis, and although we could not definitively rule out selection bias, we could not find evidence that our results are attributable to selection bias.

Conclusions. For some women, breast cancer may impose an economic hardship because it causes them to leave their jobs. However, for women who survive and remain working, this study failed to show a negative effect on hours worked associated with breast cancer. Perhaps the morbidity associated with certain types and stages of breast cancer and its treatment does not interfere with work.

Key Words. Breast cancer, cancer survival, economic outcomes, employment, labor supply

The National Cancer Institute's Office of Cancer Survivorship has as one of its objectives "to develop an agenda for the continuous acquisition of knowledge concerning the problems facing cancer survivors, including the medical, psychological, and economic effects of treatment" (National Cancer Institute 1999). To date, most studies of cancer survivors can be classified under the rubric of "quality of life," where the focus is on survivors' impressions of their well-being along physical, psychological, social, and spiritual domains (for a review, refer to Gotay and Muraoka 1998). However, very little work has examined objective measures of individuals' economic circumstances after a cancer diagnosis. This study explores an important economic

outcome—labor market participation of breast cancer survivors relative to women who have never had the disease.

Employers often fear that cancer patients have lower job performance and productivity and higher absenteeism (McKenna 1987). However, economic studies of breast cancer survivors to date, though not expansive, have found mixed results of the effect of breast cancer on labor market participation. At least two studies (Ganz et al. 1996; Satariano and DeLorenze 1996) indicate that breast cancer's effect on employment is minimal. In a study of patients two and three years after their primary treatment, Ganz et al. (1996) found that 65 percent ($n = 139$) of breast cancer survivors were either working for pay or volunteering their services. The mean number of hours worked was 34.4 and 33.2 hours per week among women who were two and three years post-treatment respectively. This study concluded that women generally continue to work and perform their usual roles after treatment for breast cancer. In a study of three hundred working women at the time of their breast cancer diagnosis, 71 percent returned to work three months after diagnosis (Satariano and Delorenze 1996). However, certain factors can negatively influence employment including physical disability (Fow 1996), lack of control over schedules and type of work performed (Satariano and Delorenze 1996; Greenwald et al. 1989), and in some cases discrimination on the part of employers (Carter 1994; Berry 1993). A limitation to all studies reviewed is they do not include a noncancer control group, making the evidence difficult to interpret.

In this paper, we explore factors that influence breast cancer survivors' labor market decisions. We expand existing research in several important ways: (1) we control for health status to partially isolate the effect of breast cancer from other health conditions; (2) we compare breast cancer survivors to a noncancer group; and (3) we explore the influence of the availability of health insurance. Ideally, we would like to control for health insurance source since health insurance via an employer may play a role in increasing or at the least maintaining labor market participation. Due to our concern over the potential endogeneity of a woman's health insurance in both the decision to work and the intensity of work, we instead indicate whether a woman's spouse has health insurance through his employer (Buchmueller and Valetta 1999).

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Our findings can help researchers, clinicians, and policymakers better understand an important measure of well-being—the ability to work—once patients have been diagnosed and successfully treated. An understanding of labor market outcomes is particularly important for this population as more working age women are screened for breast cancers that might not otherwise be detected during their working years.

METHODS

Data

We use data from the first wave (1992) of the Health and Retirement Study (HRS). The HRS is a national study that contains information on many of the variables that economic theory suggests influence labor market decisions and outcomes, including measures of health status, health insurance coverage, income, assets, and demographic characteristics. The cohort interviewed is aged 51–61. There are 7,607 total households with information on 12,557 individuals. In most cases if there are two members of the household (e.g., husband and wife), each is interviewed regarding his/her own employment history, retirement, health, and demographic characteristics. Only one member of the household must be in the age range of the sample frame; therefore, spouses may be interviewed even if they are out of the specified age range. Thus, our sample departs somewhat from representativeness as we include women (due to their husbands' age) outside of the sample age frame.

For our noncancer control group, we selected women who answered “no” to the question, “Has a doctor ever told you that you have cancer or a malignant tumor of any kind?” Those women that said “yes” to this question and subsequently indicated that their diagnosis was breast cancer constitute the study group. Women who indicated that their cancer was in an organ other than the breast were excluded from the analysis. No information on breast cancer stage is provided. However, the date of diagnosis is available. The average time since diagnosis is 7.15 years prior to the interview, with nearly 80 percent of the study group diagnosed more than two years prior to the interview. We excluded women who were insured by either Medicaid or Medicare because access to public insurance has been shown to constrain labor supply (Moffitt and Wolfe 1992; Buchmueller and Valetta 1999). This restriction and the exclusion of women with missing data led to a final sample size of 5,728 women, 150 of whom reported having breast cancer. The sample of married women is 4,160 with 109 reporting breast cancer.

Empirical Approach

The outcomes of interest are employment status and usual hours of weekly work. Each can be expressed as functions of the incidence and survival of breast cancer (BCA), exogenous variables (X), availability of health insurance (HI), health status (HS), and random or unobserved influences (ε). Generically, we write the employment equation as

$$E_i^* = f(BCA_i, X_i, HI_i, HS_i, \varepsilon_i) \quad (1)$$

where E_i^* represents a latent variable for the propensity for employment. We observe that a woman is actually employed if E_i^* exceeds some critical value. We estimate the employment equation by assuming a linear additive form for equation 1,

$$E_i^* = \alpha_E + \beta_E BCA_i + X_i \gamma_E + \delta_E HI_i + \tau_E HS_i + \varepsilon_i. \quad (2)$$

We define employment status as a binary variable (E_i) that equals one if the respondent reports positive hours worked in 1991 and estimate equation 2 as a probit model. For ease of interpretation, the probit estimates are translated into derivatives of the probability of working with respect to the independent variables. The derivatives are computed as the effect of the independent variables on the probability that a woman is employed, evaluated at the sample means.

Hours worked—defined as average weekly hours worked in 1991—are zero for those who do not work, and nonzero for those employed ($E_i = 1$). In principle, desired hours of work of the nonemployed could be negative, but zero is of course the lowest possible value. Assuming a linear functional form, and assuming that the same variables that affect employment affect hours (although with a different unobserved residual), the empirical model for observed hours is

$$H_i = \alpha_H + \beta_H BCA_i + X_i \gamma_H + \delta_H HI_i + \tau_H HS_i + \eta_i, \text{ if } E_i = 1 \quad (3)$$

$$H_i = 0, \text{ if } E_i = 0 \quad (3')$$

With hours censored in this equation, it is common to attempt to estimate such models using Heckman's sample-selection correction model (Heckman 1979). A pitfall of sample-selection models is that if variables cannot be excluded a priori from the second-stage equation, identification comes from restrictions on the functional form (e.g., linearity) and distributional assumptions (e.g., normality). In the absence of a priori exclusion restrictions we chose not to use this technique, and instead simply report estimates of a linear conditional

mean function. Such a regression is informative about how the exogenous variables are related to hours of work for those who work. We report conditional OLS regression estimates of equation 3 with robust standard errors.

It has been argued that labor market decisions and health should be jointly considered (Grossman 1972) because people who are inclined to invest in attributes (e.g., education) that improve their labor market outcomes are also more inclined to invest in health. We think this is futile given our data, since we know very little about respondents' risk factors (e.g., family history, oral hormone use, diet, alcohol intake, and environmental risks) for breast cancer. Thus, we treat the incidence of breast cancer as random, other than a few known exogenous predictors out of individuals' control—such as age and race—which may be a reasonable approximation to reality.

In order for our estimates to reflect causal effects of breast cancer on labor market decisions, the residual terms must be uncorrelated with the right-hand-side variables. This is potentially problematic with respect to breast cancer survival. Even if we take the incidence of breast cancer as random conditional on other control variables, in order for a breast cancer patient to appear in our dataset, she must have survived the cancer for some time. Furthermore, because we have cross-sectional data, we cannot control for prior differences in labor market behavior between the cancer and control groups. To fully address these issues, we would require longitudinal data on women before and after the onset of breast cancer that are largely unavailable in the HRS. However, we have available a number of control variables—such as wealth, race, age, and education—that are plausibly correlated with survival outcomes as well as prior (and current) labor market behavior. For example, racial and ethnic minority and low-income populations have both lower breast cancer incidence rates and lower survival rates relative to white, non-Hispanic women and middle- and upper-income populations (Wingo et al. 1999; McGinnis et al. 1999; Shinagawa 2000). It is therefore instructive to compare the estimated effects of cancer incidence and survival time with and without these controls. If the inclusion of the controls has much influence on the estimated effects, then an additional role for unobservables seems likely. On the other hand, if the inclusion of these controls has no influence, it seems less likely that unmeasured characteristics would be important.

Variables

Changes in work may be determined by women and their families or by their employers (e.g., layoffs or discriminatory behavior). In either case, the

employment or hours worked by women with breast cancer will likely decrease. However, if the effects of breast cancer and its treatment on employment are temporary, as suggested by some studies, we would expect to see a negative relationship between breast cancer and work initially, but this effect should diminish over time. To reflect this possibility, we considered several specifications for breast cancer. Our alternatives were to enter breast cancer in our equations as either a binary variable, indicating the presence or absence of breast cancer, or as an ordinal or continuous variable, indicating the years since diagnosis. A single-year interval between the time since diagnosis may be unequal in its impact on employment if there is a nonlinear relationship between years since diagnosis and the labor market decisions and outcomes we study. Therefore, we entered years since diagnosis into our estimations as ordinal variables in separate regression equations and used F-tests to examine the relative contributions of the restricted and unrestricted models. Based on our analysis, we found three critical distinctions among women: no cancer, cancer diagnosed in two or fewer years prior to the interview ($n = 33$), and cancer diagnosed three or more years prior to the interview ($n = 117$).

Health insurance is also likely to affect the probability of working (Friedland 1996; Gruber and Madrian 1993). Women who obtain health insurance from their employers may not exit the labor market and may be unwilling to reduce the number of hours worked especially if they have a serious health condition (Madrian 1994; Monheit and Cooper 1994; Buchmueller and Valetta 1999; Kapur 1998). However, it is highly likely that the presence of employer-based health insurance coverage is endogenous to a model estimating the decision to work and so we approach the estimation of the effect of health insurance by using information on spousal health insurance (Buchmueller and Valetta 1999). If a spouse has health insurance via his employer then his wife may have an alternative source of coverage that is not directly related to her employment. Thus, she may be more willing to exit the labor market or reduce her hours.

Also of importance is how to control for the influence of health status, apart from breast cancer, on labor market decisions. The HRS records the presence of a limited set of health conditions: diabetes, high blood pressure, heart disease, pulmonary conditions, stroke, and depression. In addition, the HRS records a subjective measure of respondents' health based on responses to perceived health status (ranging from excellent to poor). The comorbidities in the HRS are an incomplete list of conditions that may affect employment. Self-reported overall poor/fair health may be a substitute for reporting

underlying conditions (Dwyer and Mitchell 1999); however, its inclusion may absorb some of the effect of breast cancer. In subsequent analyses, we control for health status both ways—by using the limited set of conditions in the HRS and by using self-reported poor/fair health in the equations.

Aside from these key variables, we also control for age, marital status (never married, separated/widowed/divorced, and married), education (no high school diploma, high school diploma, some college, and college degree), the presence of children younger than age 18 either living at home or away at school, job type (white collar, blue collar, and service), spouse's earnings (for married women only), nine census regions, and race (Hispanic, African-American/non-Hispanic or white/other/non-Hispanic). For brevity, we do not report coefficients for the regions. We also include a term for total wealth that is defined as the value of respondent's housing equity plus nonhousing equity (e.g., value of vehicles, bank accounts, investments, retirement funds, business equity).

RESULTS

Descriptive Statistics

Table 1 presents descriptive statistics for the dependent and independent variables of interest. The prevalence estimate of breast cancer is 2.6 percent ($n = 150$). This is comparable to the national breast cancer prevalence for women 40–65 years of age based on 1997 Surveillance, Epidemiology, and End Results (SEER) data. The average time since diagnosis is 7.15 years ($SD = 6$, range 1–34). Overall, this sample can be described as predominantly white, married, and middle-aged (mean age is 54), and as having a high school education or better. Women with breast cancer are significantly different from the comparison group in their age and more are in poor/fair health. The racial/ethnic differences are not surprising given that white, non-Hispanic women are both more likely to get breast cancer and are more likely to survive breast cancer compared to other racial and ethnic groups (Shinagawa 2000). Far fewer women with breast cancer work (55 percent versus 67 percent), but for those who do work, they work more hours per week (41.19 versus 38.47).

Probability of Working

Table 2 provides the probit estimations for the probability of working. At the mean for all covariates, we estimate that the probability of women with breast cancer working is 10 percentage points less ($p = .015$) than for women who do

Table 1: Descriptive Information

	<i>Women with Breast Cancer n = 150</i>	<i>Women without Breast Cancer n = 5,578</i>	<i>All Women n = 5,728</i>
Demographic			
Age	55.31*** (4.51)	54.18 (4.77)	54.21 (4.76)
Wealth	\$265,132 (\$476,627)	\$233,607 (\$502,072)	\$234,433 (\$501,408)
Married	76.67%	75.87%	75.89%
Never married	4.00%	4.61%	4.59%
Divorced, separated, or widowed	19.33%	19.52%	19.52%
Presence of any children < 18 years	6%	6.88%	6.86%
No high school diploma	23.33%	25.56%	25.51%
High school diploma	42.67%	39.33%	39.42%
Some college	18.67%	19.68%	19.66%
College degree	15.33%	15.42%	15.42%
White/other ¹	81.33%**	74.60%	74.77%
African-American	13.33%	16.39%	16.31%
Hispanic	5.33%**	9.02%	8.92%
Spouse has employer health insurance	58.72%	54.65%	54.76%
Employment			
Employed	55.33%***	66.60%	66.31%
Weekly hours worked	41.19* (13.30)	38.47 (13.87)	38.53 (13.86)
Occupation			
Service sector occupation	18.07%	22.06%	21.98%
Blue collar occupation	7.23%*	12.20%	12.09%
White collar occupation	74.70%*	65.73%	65.93%
Health Status			
Years since diagnosis	7.15 (5.98)	—	—
Diabetes	12.67%	8.84%	8.94%
High blood pressure	39.33%	34.65%	34.78%
Heart disease	6.67%	8.64%	8.59%
Stroke	2.0%	1.56%	1.57%
Pulmonary	6.0%	6.78%	6.76%
Depression	6.67%	4.30%	4.36%
Poor/fair health status	26.67%***	17.00%	17.25%

Means or sample percentages are reported with standard deviations of continuous variables in parentheses.

*Significantly different from sample of women without breast cancer at $p \leq .10$, ** $p \leq .05$, *** $p \leq .01$.

¹ Category includes mainly white/non-Hispanic (97%), and the remainder are American Indian, Asian, other/unknown.

Table 2: Probability of Working (N = 5,728)

Independent Variable	1	2	3	4	5	6
Breast cancer	-.10** (.04)	—	-.09** (.04)	—	-.07* (.04)	—
1–2 yrs. since diagnosis	—	-.12 (.09)	—	-.11 (.09)	—	-.09 (.09)
3+ yrs. since diagnosis	—	-.09** (.05)	—	-.08* (.05)	—	-.07 (.05)
Diabetes	—	—	-.09*** (.02)	-.09*** (.02)	—	—
High blood pressure	—	—	-.04*** (.01)	-.04*** (.01)	—	—
Heart disease	—	—	-.05** (.02)	-.05** (.02)	—	—
Stroke	—	—	-.10* (.05)	-.10* (.05)	—	—
Pulmonary	—	—	-.07*** (.03)	-.07*** (.03)	—	—
Depression	—	—	-.22*** (.03)	-.22*** (.03)	—	—
Poor/fair health	—	—	—	—	-.23*** (.02)	-.23*** (.02)
High school diploma	.11*** (.02)	.11*** (.02)	.10*** (.02)	.10*** (.02)	.08*** (.02)	.08*** (.02)
Some college	.16*** (.02)	.16*** (.02)	.15*** (.02)	.15*** (.02)	.13*** (.02)	.13*** (.02)
College degree	.22*** (.02)	.22*** (.02)	.20*** (.02)	.20*** (.02)	.18*** (.02)	.18*** (.02)

continued

Table 2: Continued

Independent Variable	1	2	3	4	5	6
Age	-.02*** (.001)	-.02*** (.001)	-.02*** (.001)	-.02*** (.001)	-.02*** (.001)	-.02*** (.001)
Black	.06*** (.02)	.06*** (.02)	.07*** (.02)	.07*** (.02)	.08*** (.02)	.08*** (.02)
Hispanic	-.05* (.03)	-.05* (.03)	-.05** (.03)	-.05** (.03)	-.02 (.03)	-.02 (.02)
Separated/divorced/widowed	.15*** (.02)	.15*** (.02)	.16*** (.01)	.16*** (.01)	.17*** (.01)	.17*** (.01)
Never married	.13*** (.03)	.13*** (.03)	.13*** (.03)	.13*** (.03)	.14*** (.03)	.14*** (.03)
Children younger than 18	-.10*** (.03)	-.10*** (.03)	-.10*** (.03)	-.10*** (.03)	-.10*** (.03)	-.10*** (.03)
Wealth/1,000	-.00004*** (.00001)	-.00004*** (.00001)	-.00005*** (.00001)	-.00005*** (.00001)	-.00005*** (.00001)	-.00005*** (.00001)
Log likelihood	-3398.76	-3398.70	-3344.50	3344.46	-3318.36	-3318.34
Pseudo R ²	.07	.07	.09	.09	.09	.09

Standard errors shown in parentheses. Omitted categories are: excellent, good, or average health status, no high school diploma, white/other, married, and no children younger than age 18 living at home or away. Partial derivatives of the probability of employment are reported, evaluated at sample means. In a related regression, the inclusion of publicly insured women ($n = 482$) did not substantively alter the results.

* $p \leq .10$; ** $p \leq .05$; *** $p \leq .01$.

not have breast cancer (column one). Columns two, four, and six of Table 2 differentiate between relatively recent diagnosis and survival for three or more years. The effect of breast cancer is negative ($-.09$) and statistically significant ($p < .05$) only for women three or more years since diagnosis (columns two and four). The coefficient for women more recently diagnosed is larger, but not statistically significantly different from zero, and also not significantly different from the estimated coefficient for those women diagnosed three or more years ago. We remind the reader that the number of women diagnosed two or fewer years prior to the interview is very small ($n = 33$).

Columns three and four of Table 2 include dummy variables for comorbidities. Each comorbidity has a negative, statistically significant effect on the probability of working. The inclusion of these variables did not substantially affect the coefficients for breast cancer. Columns five and six of Table 2 include a single dummy variable for poor/fair health status. The negative effect of health status on the probability of working is as one would expect. In this specification, the coefficient on breast cancer remains negative although of slightly smaller magnitude ($-.07$, $p = .06$). Although breast cancer does not appear to have a statistically significant ($p < .05$) effect on the probability of working once poor/fair health status is controlled (column five and six), poor/fair health status may reflect some of the effect of breast cancer, so the estimates excluding poor/fair health status or including the comorbidities (some of which should be unrelated to the cancer) may provide better estimates of the overall effect of the disease.

We next test, in Table 3, the effect health insurance has on the decision to work among married women and how this mediates the effect of breast cancer. We also include the natural log transformation of husband's earnings. Its coefficient is positive, which is surprising in light of standard labor supply models, but may reflect assortative mating or complementarities in the consumption of time of older men and women. The presence of a spouse having employer-based insurance and poor/fair health status both have negative and statistically significant effects on women's decisions to work. However, the magnitude and significance of the breast cancer coefficient remains the same when spouse insurance is added to the model.

We also test the hypothesis that the probability of working for married women with breast cancer whose spouses have employer-based coverage is significantly different from that of married women with breast cancer whose husbands do not have insurance coverage with an interaction term. This difference was not statistically significant (specification not reported). Thus, we fail to find evidence that the need to maintain of health insurance increases the

Table 3: Influence of Spouse Insurance on Probability of Working, Married Women Only ($N = 4,160$)

<i>Independent Variable</i>	<i>1</i>	<i>2</i>
Breast cancer	-.10** (.05)	—
1-2 yrs. since diagnosis	—	-.12 (.10)
3+ yrs. since diagnosis	—	-.09* (.06)
Poor/fair health	-.22*** (.02)	-.22*** (.02)
Husband employer-insured	-.14*** (.02)	-.14*** (.02)
Husband's earnings (log)	.01*** (.002)	.01*** (.002)
High school diploma	.10*** (.02)	.10*** (.02)
Some college	.15*** (.02)	.15*** (.02)
College degree	.21*** (.02)	.21*** (.02)
Children younger than 18	-.12*** (.03)	-.12*** (.03)
Age	-.02*** (.002)	-.02*** (.002)
Black	.10*** (.02)	.10*** (.02)
Hispanic	-.02 (.03)	-.02 (.03)
Wealth/1,000	-.00004*** (.00001)	-.00004*** (.00001)
Log likelihood	-2464.53	-2464.50
Pseudo R ²	.10	.10

See notes to Table 2.
* $p \leq .10$; ** $p \leq .05$; *** $p \leq .01$.

adverse labor market impact of breast cancer, holding constant health status and demographic characteristics.

Hours Worked

Table 4 shows results from the OLS models predicting hours worked for all women, conditional on working. We find that employed women with breast cancer work 2.99 hours more a week ($p < .05$) than employed women without

Table 4: Weekly Hours Worked, Conditional on Working ($N = 3,795$)

<i>Independent Variable</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>
Breast cancer	2.99** (1.35)	—	3.08** (1.35)	—	3.16** (1.35)	—
1–2 yrs. since diagnosis	—	.81 (2.70)	—	.81 (2.71)	—	.99 (2.68)
3+ yrs. since diagnosis	—	3.60** (1.54)	—	3.71** (1.54)	—	3.76** (1.53)
Diabetes	—	—	.53 (.94)	.54 (.94)	—	—
High blood pressure	—	—	–.39 (.47)	–.37 (.47)	—	—
Heart disease	—	—	.63 (.86)	.62 (.86)	—	—
Stroke	—	—	–3.37 (2.36)	–3.40 (2.36)	—	—
Pulmonary	—	—	.73 (.88)	.73 (.88)	—	—
Depression	—	—	–3.27*** (1.08)	–3.28*** (1.08)	—	—
Poor/fair health	—	—	—	—	–1.74** (.75)	–1.74** (.75)
High school diploma	–.83 (.67)	–.83 (.67)	–.82 (.68)	–.82 (.68)	–1.03 (.68)	–1.03 (.68)
Some college	.52 (.81)	.53 (.81)	.54 (.82)	.54 (.82)	.28 (.82)	.28 (.82)
College degree	2.66*** (.85)	2.67*** (.85)	2.65*** (.86)	2.66*** (.86)	2.38*** (.86)	2.39*** (.86)

continued

Table 4: Continued

Independent Variable	1	2	3	4	5	6
Age	-.35*** (.05)	-.35*** (.05)	-.36*** (.05)	-.35*** (.05)	-.35*** (.05)	-.35*** (.05)
Black	-.88 (.59)	-.88 (.59)	-.86 (.59)	-.86 (.59)	-.77 (.59)	-.76 (.59)
Hispanic	-.30 (.90)	-.30 (.90)	-.42 (.91)	-.42 (.91)	-.14 (.90)	-.14 (.90)
Separated/widowed/divorced	4.08*** (.55)	4.07*** (.55)	4.12*** (.55)	4.12*** (.55)	4.15*** (.55)	4.15*** (.55)
Never married	1.81** (.93)	1.81* (.93)	1.88** (.93)	1.88** (.93)	1.85** (.93)	1.85** (.92)
Children younger than 18	-3.25*** (.90)	-3.25*** (.90)	-3.27*** (.90)	-3.26*** (.90)	-3.26*** (.89)	-3.26*** (.90)
Service	-3.29*** (.72)	-3.29*** (.72)	-3.25*** (.72)	-3.24*** (.72)	-3.24*** (.72)	-3.23*** (.72)
Blue collar	1.75** (.72)	1.76** (.72)	1.75** (.72)	1.76** (.72)	1.81*** (.72)	1.82*** (.72)
Wealth/1,000	-.001** (.0006)	-.001** (.0006)	-.001** (.0006)	-.001** (.0006)	-.001** (.0006)	-.001** (.0006)
Adjusted R ²	.06	.06	.06	.06	.06	.06

Standard errors shown in parentheses. Omitted categories are: excellent, good, or average health status, no high school diploma, white/other, married, no children younger than 18 living at home or away, and white collar employment. These estimates were not sensitive to excluding a few apparent outliers. In a related regression, the inclusion of publicly insured women ($n = 482$) did not substantively alter the results.

* $p \leq .10$; ** $p \leq .05$; *** $p \leq .01$.

breast cancer (column one). This relationship between breast cancer and hours worked is of similar magnitude and significance when comorbidities and poor/fair health status are included (columns three and five). Employed women who were diagnosed three or more years prior to the interview work approximately three and a half hours more per ($p < .05$) week than women without breast cancer, even when comorbidities and poor/fair health status are controlled in the analysis (columns two, four, and six). Specific comorbidities, with the exception of depression, do not have a statistically significant effect on hours worked.

In a longer working paper, we also explored the possibility that part-time employed women diagnosed with breast cancer exit the labor force, while women employed full-time, who are perhaps more committed to their jobs, remain working after their diagnosis (Bradley, Bednarek, and Neumark 2001). If this were true, we should find that employed breast cancer survivors are relatively more likely to work full-time, and that the hour differential should disappear when we subdivide the sample into full- and part-time workers. However, we found no statistically significant effect of breast cancer on the probability of being employed 35 or more hours per week. In addition, we do not find that breast cancer has an effect on the number of hours worked per week for women employed full-time, and we find a positive effect for women working less than 35 hours per week. Thus, the data are not consistent with the hypothesis that women employed part-time tend to leave their jobs after breast cancer diagnosis.

Selection Bias

Prior to drawing conclusions about the relationships we observe, we turn to the issue of selection bias in the sample of breast cancer survivors. It could be that survivors are more committed to the labor force before their diagnosis. The women who work may have higher educational attainment and higher socioeconomic status, and thus, may be more likely to be diagnosed at earlier stages and have less severe disease. To shed some light on this possibility, we repeated our estimations without controls for wealth, race, age, and education (Table 5). These variables have been identified with both surviving breast cancer and labor force participation. If the exclusion of these controls does not substantively influence the estimated effects of breast cancer, then the argument for selection bias is weakened. When we drop these controls, we find that the estimated effect on hours is either unchanged or slightly smaller (Table 5). If we were “worsening” the selection bias, we would expect the

Table 5: Regressions without Age, Race, Education, and Wealth Variables

<i>Independent Variable</i>	<i>Probability of Working</i>	<i>Probability of Working</i>	<i>Hours Worked</i>	<i>Hours Worked</i>
Breast Cancer	− .09** (.04)	—	2.80** (1.40)	—
1–2 years since diagnosis	—	− .09 (.09)	—	.44 (2.96)
3+ years since diagnosis	—	− .09** (.05)	—	3.46** (1.57)
Poor/fair health	− .27*** (.02)	− .27*** (.02)	− 2.52*** (.72)	− 2.52*** (.72)
Separated/widowed/divorced	.15*** (.01)	.15*** (.01)	3.11*** (.52)	3.11*** (.53)
Never married	.15*** (.03)	.15*** (.02)	1.75* (.91)	1.74* (.91)
Children younger than 18	.001 (.02)	.001 (.02)	− 1.48* (.87)	− 1.48* (.87)

Standard errors shown in parentheses. Omitted categories are: excellent, good, or average health status, married, and no children younger than 18 living at home or away.

* $p \leq .10$; ** $p \leq .05$; *** $p \leq .01$.

results to be larger. Thus, we have some support for a causal interpretation of our findings. In a more extensive working paper, we performed additional analyses with regard to selection and found a consistent story (Bradley, Bednarek, and Neumark 2001). One such analysis included job tenure information that was available for a smaller sample of women. We found that the estimated labor supply differentials associated with breast cancer are unaffected by a tenure control variable. Overall, our ability to address selection bias with data available in the HRS is limited, but the findings in Table 5 are informative and provide evidence against such bias.

DISCUSSION

The American Cancer Society estimates that there will be about 175,000 new cases of invasive breast cancer per year among women in the United States (American Cancer Society 2000). These diagnosis may influence the decisions women and their employers make regarding employment status and hours worked. We find evidence that the probability of breast cancer survivors

working is less (10 percentage points) than that for women without breast cancer. This is an important finding that has not been previously addressed in the literature. To date, research has focused on subjective measures of quality of life without giving consideration to the economic dimension of cancer survivorship. For some women (particularly those in good health prior to a breast cancer diagnosis), breast cancer may negatively affect their decision to work. This decision will impose costs on women and their families as well as imposing costs on society.

Among employed women, those with breast cancer may work more hours per week than those without breast cancer. Although this latter finding is counterintuitive, we cannot easily dismiss it. One plausible explanation for this finding is that women may be unwilling to reduce the number of hours they work or to exit the labor force if there is a threat of losing health insurance coverage. However, our analysis did not support this hypothesis, although further research on this question is warranted. Another reasonable explanation is selection bias inherent to a sample of women who are diagnosed with and have survived breast cancer. While this explanation requires analyses with new data sources, the limited evidence available at this point does not support an explanation based on selection bias. A simpler explanation is that for women who continue to work, the morbidity associated with certain types and stages of breast cancer and its treatment may not interfere with work.

There are also possible explanations of a causal effect of breast cancer that increases labor supply among those who continue to work. One explanation may be that women (and families) are trying to restore savings that were depleted during illness and treatment; both reduced consumption and increased labor supply are a means to this end. A second explanation is that cancer survivors approach their jobs with renewed vigor. Under such an interpretation, our finding should be viewed as hopeful for employed women who are diagnosed in early stages of breast cancer, and caution employers against discriminatory treatment of their workers who are breast cancer survivors. However, both of these explanations are hypothetical at this point, and call for additional evidence and testing.

Our study has several limitations. First, we estimate models of labor market outcomes for survivors, so the total effect of breast cancer is underestimated (since the effects of those who died are not measured). Second, substantial evidence indicates that the burden of cancer is borne unequally by low-income and minority populations (Shinagawa 2000). If it is these individuals that leave the labor force, then the economic effects of cancer

are likely to be more serious for them. Our data do not allow us to adequately address this because the sample size is too small to permit the estimation of the effects of cancer on particular subpopulations of women. Third, the HRS does not have longitudinal information on work history and job characteristics prior to a breast cancer diagnosis, which would allow more definitive causal conclusions. If we followed HRS respondents over time and restricted the analysis to those with pre-cancer observations, the sample size of women diagnosed with breast cancer during the course of the study would be too small for meaningful analyses. The implication of this data issue is that longitudinal studies that follow individuals with and without cancer over time are needed to more decisively determine the effects of cancer on employment and hours worked. The Office of Cancer Survivorship may want to consider this finding in light of their objective of acquiring economic data on cancer survivors.

Finally, another limitation is the relatively small number of cancer survivors available for analysis. As a result, estimated effects have to be quite large to achieve statistical significance. Even so, across a variety of specifications, the breast cancer coefficients on which we focus remained the same sign and similar magnitude—bolstering our conclusions.

Our study provides the first analysis of differences between cancer survivors and a noncancer control group along economic dimensions. We show that breast cancer may have a negative effect on the decision to work and for some women this may impose an economic hardship. For women who survive and remain in the workforce, however, this study fails to show a negative effect on hours worked associated with breast cancer and instead indicates a positive effect. Thus, preconceived notions regarding breast cancer and work-related disability may be incorrect in some circumstances. A challenge for future research is to determine if the pattern we observed for women with breast cancer is robust and if these findings are applicable to other cancer sites.

ACKNOWLEDGMENT

The authors would like to thank Donna Edwards Neumark for her helpful comments. Dr. Bradley's work was supported by NCI grant "Labor Market Outcomes of Cancer Survivors" (R01 CA86045). Dr. Neumark's work was partially supported by NIA grant K01-AG00589.

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