

# Labor Market Outcomes of Cancer Survivors

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## Research aims

- Determine how employed individuals diagnosed with cancer change their labor supply.
- Examine if labor supply changes lead to changes in health insurance and income.

## Cancer detection in working age people

- Screening is recommended for working age people, and as screening technology improves, tumors of smaller size that would have gone unnoticed will be detected and treated.
- Treatment is aggressive, even for early stage tumors.

## Cancer detection in working age people

- Individuals are likely to bear the consequences of cancer during their working years when they may have otherwise lived and functioned for some time without knowledge or effects of their disease.

## Our past work

- Breast cancer has a long-term negative effect on labor supply (9 percentage points).
- But, for women who remained working, they worked more hours per week relative to non-cancer controls.

## Research design

- Inception cohort of women diagnosed with breast cancer and men diagnosed with prostate cancer.
- Longitudinal with assessment periods at 6, 12, and 18 months following diagnosis relevant to a period 3 months prior to diagnosis.
- Comparisons made to a non-cancer control group.

Why do we need a control group?

## Role of the control group

- Causal effect of cancer can only be inferred if people with the disease make labor supply changes at a higher rate than the control sample.
- Labor market conditions over the course of the study can confound the effects of cancer.

## Data sources

- Cancer: Detroit Metropolitan Surveillance, Epidemiology, and End Results (SEER) registry
- Controls: Detroit Primary Metropolitan Statistical Area (PMSA) of the Current Population Survey (CPS)
  - Conducted by the Bureau of Labor Statistics

## Reasons why we used secondary data source

- Money, money, money.
- Credible source.
- Timing was right.

## Inclusion criteria

- Age between 30 and 64 at the time of diagnosis
- English speaking
- Employed or with an employed spouse
  - Non-employment is a persistent state for older men & women.

## Cancer subjects

- 496 women with breast cancer
- 294 men with prostate cancer
  - 83% response rate
  - 90% retention for the entire 18 month study period

# Current Population Survey

- Can match respondents from one survey to the next (month-in-sample) so that the interview match the primary data collection time span.
- Not a “perfect” match to a cancer sample.
- Much less expensive than additional primary data collection.

## CPS structure

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CPS	MIS 1	MIS 2	MIS 3	MIS 4									MIS 5	MIS 6	MIS 7	MIS 8
	⋮			⋮												⋮
6 month sample	▼			▼												▼
				-3	-2	-1	0	1	2	3	4	5	6			
12 month sample	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11	12

## Sampling issues

- Differences in the cancer and control groups can lead to biased estimates of the effect of cancer.
- Age, education, and marital status differences were apparent in the two groups.
- Statistically correct for differences using propensity score methods.

## Primary labor supply outcomes

- Probability of employment following diagnosis
- Weekly hours worked following diagnosis

## Selection bias

- Dedicated workers remain at work regardless of cancer.
  - Study changes in hours worked.
- Minimally effected by the disease and/or its treatment.
  - Will bias the negative affect of cancer toward zero.

## Secondary outcomes

- Treatment induced disability
- Employer accommodation
- Influence of health insurance

# Breast Cancer

## Descriptive statistics

- 2/3 of the women diagnosed with early stage disease.
- 31% of breast sample were non-employed 6-months following diagnosis.
- 16% of control sample were non-employed same time period.
- Illustrates important role of the control group.

**Descriptive statistics for the cancer and Detroit CPS sample**

	Breast sample employed (n=445)	Detroit employed PMSA MIS 4 (n=372)
<b>Breast Cancer</b>		
<i>In situ</i>	25.84%	N/A
Local	42.02%	N/A
Regional/Distant	28.99%	N/A
Invasive/unknown	3.15%	N/A
<b>Mean age</b>	50.62 (7.57)***	44.59 (7.88)
<b>Race/ethnicity</b>		
White, Hispanic, non-black	77.98%	78.76%
African-American, non-Hispanic	22.02%	21.24%
<b>Marital status</b>		
Married	60.22%***	64.52%
Divorced, separated or widowed	29.89%***	20.43%
Never married	9.89%***	15.05%
<b>Children <math>\leq</math> 18</b>	31.24%***	49.19%
<b>Education</b>		
No high school diploma	4.94%***	5.91%
High school diploma	22.25%***	35.22%
Some college	38.43%***	25.81%
College degree	34.38%***	33.06%
<b>Household income</b>		
$\leq$ \$20,000	7.21%	10.31%
$\geq$ \$75,000	41.16%	39.38%
<b>Employment characteristics</b>		
Employed at 1 <sup>st</sup> interview	100.00%	100.00%
Employed at 2 <sup>nd</sup> interview	68.54%***	84.14%
Mean hours worked per week 1 <sup>st</sup> interview	39.47 (12.30)***	37.67 (10.30)
Mean hours worked per week 2 <sup>nd</sup> interview	33.49 (12.30)***	38.09 (9.80)

\*\*Significantly different from the Detroit PMSA sample at  $p < .05$ , \*\*\* $p < .01$ .

## Probability of employment

- 18 percentage points less likely to be employed 6 months following diagnosis relative to controls.
- No statistically significant effect for women with *in situ* cancer.
- Greater negative effect associated with invasive cancer stages.

**Probability of employment, conditional on prior employment,  
n=747**

<b>Independent variables</b>	<b>(1) Base model</b>	<b>(2) Stage included</b>	<b>(3) Propensity score</b>
Propensity score	N/A	N/A	-0.22 (.26)
Breast cancer yes/no	-0.18 (.03)***	N/A	-0.17 (.03)***
<i>In situ</i>	N/A	-0.02 (.06)	N/A
Local	N/A	-0.18 (.05)***	N/A
Regional/Distant	N/A	-0.34 (.06)***	N/A
Unknown stage	N/A	-0.16 (.15)	N/A
<b>African-American</b>	<b>-0.13 (.05)***</b>	<b>-0.12 (.05)***</b>	<b>-0.12 (.04)***</b>

Notes: \*Significant at p<.10, \*\*p<.05, \*\*\*p<.01.

## Probability of employment

- Estimates are robust when propensity score is added to the model.
- In terms of the controls, only the coefficient for African-American women was statistically significant.

## African-American women

- Estimated separate models for White and African-American women.
- The effect of breast cancer on the probability of employment was twice as strong for African-American women.
  - -.35 vs. -.14,  $p < .01$
  - Explored demographic differences (e.g., age, marital status), income, and physical demands on the job, but were unable to explain differences in employment.

## Hours worked

- Nearly 7 hours or 18% fewer hours worked per week by women with breast cancer.
- Negative effect for every stage ranging from 12% (*in situ*) to 28% (unknown) fewer hours worked per week.

**Changes in weekly hours worked, conditional on 2<sup>nd</sup> period employment, n=540**

Independent variables	(1) Raw change	(2) Raw change	(3) Raw change, propensity score	(4) Percent change	(5) Percent change	(6) Percent change, propensity score
Propensity score	N/A	N/A	2.67 (6.96)	N/A	N/A	-0.05 (0.23)
Breast cancer (yes/no)	-6.68 (0.87)***	N/A	-6.97 (0.85)***	-0.18 (0.03)***	N/A	-0.19 (0.03)***
<i>In situ</i>	N/A	-3.70 (1.15)***	N/A	N/A	-0.12 (0.04)***	N/A
Local	N/A	-6.94 (1.04)***	N/A	N/A	-0.18 (0.03)***	N/A
Regional/distant	N/A	-10.18 (1.27)***	N/A	N/A	-0.28 (0.04)***	N/A
Unknown stage	N/A	-6.22 (3.12)**	N/A	N/A	-0.16 (0.10)	N/A

\*Significant at p<.10, \*\*p<.05, \*\*\*p<.01.

## What happens to women who become non-employed?

- 14% of previously employed women report that they “have a job, but are not working.”
  - Perhaps they will return since they have not severed ties with their employer.
- 2% retired and 10% considered themselves as disabled or unable to work.
  - Non-employment maybe more permanent for these individuals.

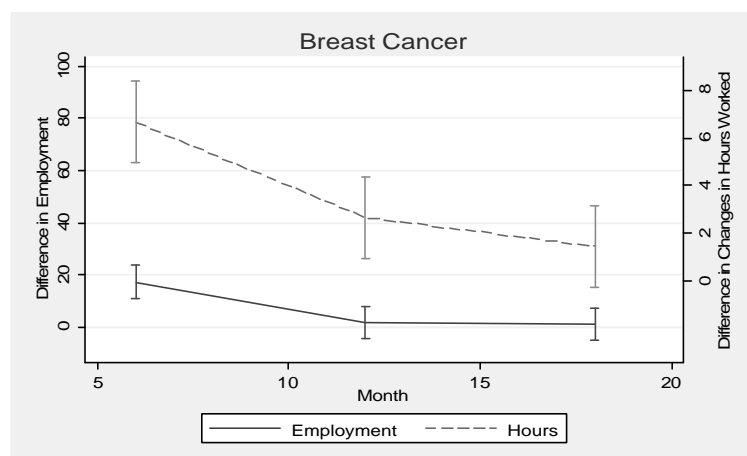
## Reasons why no longer working

- 74% illness
- 19% “other”
- 6% lay-off
- 1% family or personal obligation

## 12- and 18-month employment outcomes

- Many women with breast cancer appear to return-to-work 12 months following diagnosis and are not statistically significantly different from non-cancer controls in their probability of employment or weekly hours worked.
- Women who remain working, continue to work at or near full-time.

## Summary of employment and hours worked



## Breast cancer disabilities

Job requirements	No.†	Cancer interfered, No. (%)	95% CI	P value‡
Physical effort	271	134 (49)	(43.49 to 55.40)	<.001
Heavy lifting	145	90 (62)	(54.17 to 69.97)	<.001
Stooping	237	77 (32)	(26.53 to 38.45)	<.001
Concentration	399	123 (31)	(26.30 to 35.36)	<.001
Analysis	331	93 (28)	(23.25 to 32.94)	<.001
Keeping up with the pace set by others	275	108 (39)	(33.50, 45.04)	<.001
Learning new things	355	72 (20)	(15.26 to 23.25)	.717

# Prostate Cancer

## Probability of employment

- Less likely to be employed 6 months following diagnosis relative to controls.
- No statistically significant effect for stage, more of a treatment effect.
- Greater negative effect associated with surgical interventions at 6 months.

**Probit model (likelihood expressed as percentage points with 95% CIs) of employment, 6 month diagnosis (n = 547)\***

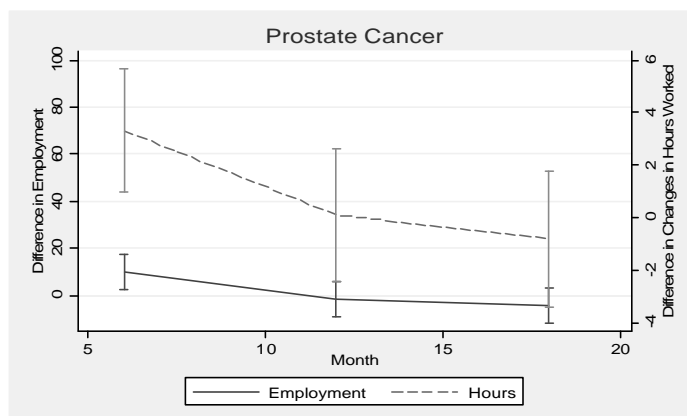
Independent variables	Prostate cancer	Cancer stage	Treatment	Propensity score
Propensity score	N/A	N/A	N/A	-34.23 (-121.14 to 52.67)
Prostate cancer‡	-10.19 (-17.69 to -2.70)	N/A	N/A	-10.01 (-17.51 to -2.50)
Local stage‡	N/A	-10.05 (-18.67 to -1.43)	N/A	N/A
Regional or distant stage‡	N/A	-16.15 (-31.40 to -0.89)	N/A	N/A
Unknown stage‡	N/A	-14.16 (-42.36 to 14.04)	N/A	N/A
Watchful waiting‡	N/A	N/A	8.93 (-5.57 to 23.44)	N/A
Hormone ‡	N/A	N/A	13.15 (7.47 to 18.83)	N/A
Chemotherapy or radiation‡	N/A	N/A	-10.79 (-25.08 to -3.51)	N/A
Surgery‡	N/A	N/A	-16.56 (-24.65 to -8.47)	N/A

\*N/A = Not applicable. N=264 prostate cancer patients and 283 control subjects. Partial derivatives of probability with respect to independent reported with 95% Confidence Intervals in parentheses.

## Probability of employment

- Prostate cancer survivors have the same labor supply as non-cancer controls 12 and 18 months following diagnosis.
- Although a number of men reported treatment-induced disabilities.

# Summary of employment and hours worked



## Work-related disabilities experienced by employed men with prostate cancer

Job requirements	No.†	Cancer interfered, No. (%)	95% CI	P value‡
Physical effort	126	33 (26)	(18.51 to 33.87)	<.001
Heavy lifting	74	22 (30)	(19.32 to 40.14)	<.001
Stooping	119	26 (22)	(14.42 to 29.27)	<.001
Concentration	219	26 (12)	(7.52 to 16.01)	.382
Analysis	197	17 (9)	(4.68 to 12.49)	.507
Keeping up with the pace set by others	148	23 (16)	(9.70 to 21.38)	.025
Learning new things	212	11 (5)	(2.19 to 8.13)	.019

†Number of patients reporting that their job involves the listed task. For example, 126 patients report that their job involved physical effort.

## Influence of health insurance

### Sample

- Married, employed, and employer-based health insurance.
  - 201 women with breast cancer
- Excluded women with “double” coverage or uninsured.
- Quasi-experimental design.

## Potential selection

- Women who have health insurance through their own employer (ECHI=1) may be different from women with health insurance through their spouse's employer (ECHI=0).
  - Asked job involvement questions and questions about job tasks (physical intensity); no differences were observed.

## Labor supply

- Women with health insurance through their own employer were more likely to be employed and to work more hours 6, 12, and 18 months following diagnosis relative to women with health insurance through their spouse.
  - Consistent results when controlling for stage and interaction terms.

## HIPAA's influence

- HIPAA allows employees to add to their insurance policy (if it covers families) a spouse or other dependents who lose job-related coverage.
  - Not helpful if husband does not have health insurance coverage through his employer.
- HIPAA offers very little protection.

## Husbands of women with ECHI through own employer

- 11 had insurance through their employer
- 51 had insurance exclusively through their wife's policy
  - Only 40% of these men worked for employers that *offered* health insurance coverage.

## Consequences

- Non-compliance with treatment
- Health sacrifices

## Conclusions

- Substantial work loss attributable to cancer 6 months following diagnosis.
- Number of cancer survivors in the work force 12 and 18 months following diagnosis.
- Clear link between work loss and health insurance.

## Conclusions

- Employer-based health insurance appears to be an incentive to remain working and to work at a greater intensity when faced with a serious illness.
  - Previously unmeasured benefit to the employer.

## Conclusions

- The health implications of this apparent consequence of employment-based health insurance are yet to be measured.
  - Others studies have shown that continuing to work when ill may have adverse consequences.
  - Some women confided that they quit treatment because it interfered with their ability to work.

## Clinical implications

- Awareness of work loss related to detection and treatment.
- Work loss is an important outcome that should be considered when evaluating cancer treatments.
- Patients may require interventions that improve time to recovery and minimize economic loss.
- Patients may become “non-compliant” because insurance and other work-related incentives.

## Policy implications

- If workers are constrained in their ability to recover following a health shock because insurance is contingent on employment, then policy changes may boost their recovery.
  - Make COBRA less expensive and require that it cover a longer period of time.
  - Offer state health insurance coverage for those diagnosed with severe illness.
  - Extend FMLA’s coverage period and offer replacement wages during the absence.

## Policy implications

- Sponsor rehabilitation programs for individuals diagnosed with and treated for cancer.

## Areas for future research

- Collection of employment information in cancer studies.
  - Other sites of cancer deserve attention. In fact, the employment consequences of cancer and its treatment are likely to be much greater for sites other than breast and prostate cancer, in which case the LMOS findings may be overly optimistic.
  - For employed patients, employment outcomes (e.g., return to work, hours worked, disability) may be a more definitive measure of recovery and functioning than the generic quality of life measures that are often used in clinical trials

## Areas for future research

- Research into racial and ethnic minority patients and employment outcomes.
  - The negative effects of cancer were twice as strong for African-American women and were persistent at 18 months following diagnosis. The reasons for this difference are unknown and warrant further study.

## Areas for future research

- Interventions to reduce the effects of cancer and its treatment on employment.
  - Many symptoms can be controlled through aggressive symptom management and/or rehabilitation protocols. Research is needed to improve work outcomes through clinical interventions—particularly during the active treatment period.
- Investigations into the influence of employment-contingent health insurance on cancer treatment and recovery.

