Cancer survivorship and labor market attachments: Evidence from 2008-2014 MEPS data

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Presentation outline

- Motivation and previous literature
- Contributions and findings
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- Conclusions and implications

Motivation

- Approximately 20 million U.S. citizens affected with at least one type of cancer were alive in 2017, a number expected to grow rapidly within ten years (Siegiel et al., 2017)
- Rising cancer survival rates and later retirement age improve the probability of labor market attachments for cancer survivors (Gupta et al.,2015)
- Due to physiological differences and course of cancer progression, labor market responsiveness to gender-specific cancers may differ for males and females.
- Studies on the labor market attachments for the gender-specific cancer survivors are increasingly important but surprisingly sparse in economics literature.
- The 2008 ADA exogenous policy shift provides a natural time break for assessing the labor market attachments of cancer survivors

Cancer survivorship and labor market

- Movement limitations and high levels of fatigue were identified among 5-year breast cancer survivors.
- Challenges with mental rotation and recall of spatial information have been reported for post-treatment prostate cancer survivors.
- When chronic health conditions result in fatigue and physical weakness, those in physically demanding jobs are more likely to leave their jobs (Currie and Madrian, 1999)
- Annual income loss is reported among cancer survivors (Drolet et al., 2005)

Previous literature

- Recent literature on the labor market outcomes of cancer survivors presents mixed effects of cancer on the labor market attachments.
- Survivors of different types of cancer have 8% lower employment rates than their comparison cancer-free group (Moran et al.,2011)
- Short et al. (2008) find a negative short-term and but no long-term effect of cancer on employment.
- Heinesen and Kolodziejczyk (2013) find that that cancer increases the likelihood of job market exiting only within the first 3 years of diagnosis.
- Ganz et al. (2002) report that only 20% of breast cancer survivors experience employment changes while the rest of them especially after the first 5-7 years of diagnosis do not show any work change at all

Contributions of this paper

1. Causal effects of cancer on labor market attachments
   - To estimate the effects of gender-specific cancer survivorship on the labor market outcomes.
2. Methodological improvements
   - This study explains the effects of cancer survivorship on labor market outcomes using a nationally representative dataset.
   - Unlike previous studies, we include prime working age groups (18-64)
   - Due to lack of detailed datasets, past studies have excluded certain types of cancer while we capture effects of all types of cancer.
   - Improved statistical modelling technique

Findings

- Male- and female-specific cancers lower the likelihood of employment by 1.5 % and 10%, respectively, when compared with cancer-free groups.
- Female-specific cancers increase the weekly-hours of working by approximately 3h while male-specific cancers has almost no effect on hours of working, when compared with cancer-free groups
- Gender-specific cancers has no statistically significant effect on hourly wage for both full-and part-time workers, when compared with cancer-free groups.
- Cancers increase the likelihood and number of lost working days by 14% and approximately 1.5 days for females but no effect for males.
- Incidence of cancer-associated lost working days and indirect productivity cost are higher for females compare to males.

Research questions

1. What are the effects of gender-specific cancer survivorship on the labor market attachments of prime working age U.S. population?
   - Employment status
   - Weekly hours worked
   - Hourly wage rate
2. What is the annual cost of workplace absenteeism associated to cancer survivorship?

Theoretical model

Labor market attachments can be affected by cancer survivorship as a form of chronic condition in at least four different pathways (Wilson, 2001).

1. Decrease in the availability of total time for a cancer survivor due to increased allocation of time to health maintenance.
2. Financial burden of cancer can be substantial for survivors and their families.
3. Changes in wages due to productivity loss induced by cancer
4. Employment probability decreases if the effect of leisure-work switch on the marginal utility of consumption is weak.

Empirical model

We estimate the variants of equation (1) using correlated random effect models.

$$y_{it} = f(\lambda_0 + \Theta_{it}\tau + Z_{it}\pi + \alpha_i + \kappa_{it}) \tag{1}$$

where

- y_{it} is the labor market outcome for an individual i in time period t.
- λ_0 is a constant.
- Θ_{it} is a vector of observed regressors.
- Z_{it} is an indicator variable denotes whether the respondent exhibits cancer survivorship.
- α_i is the stochastic time-invariant term that captures the unobserved measures of productivity, physical and mental health.
- κ_{it} is the idiosyncratic error.

Empirical model-cont.

- Correlated Random Effects model (CRE) allows the correlation of α_i with all the covariates in all periods. As a result, α_i is modeled by a linear projection that contains all the covariates and no constant term.
- For the labor supply model, Jakubson (1988) proposes a two-step strategy to estimate the linear projection model
  1. Equation-by- equation estimation to get consistent estimates of reduced form equation.
  2. Obtaining the structural parameters through Minimum distance estimator
- Finally, CRE probit model in the first stage and RE over-dispersion model in the second stage are implemented to estimate the effects of cancer survivorship on absenteeism.

Data

- 2008-2014 waves of the Medical Expenditure Panel Survey (MEPS), a national survey conducted by the Agency for Healthcare Research and Quality (AHRQ) since 1996 is used.
- The sample is limited to prime age working adults (18-64), not self-employed, not full-time student, having positive survey weights. After several steps of data cleaning, the final estimation sample of 51,878 (23, 412 men and 28,466 women) comprises of 4,463 cancer and 47,415 non-cancer observations.
- A binary variable indicating employment status is created. In addition, conditional on employment, every individual provides detailed information on weekly hours of work and hourly wage rate.
- MEPS variables on illness related absenteeism is used. It asks if the respondent misses a full working day due to illness,

Descriptive statistics

- Approximately, 70% of all the survey respondents, aged 18-64 are actively employed and this percentage is higher for men. On average, men work 41 hours per week with an hourly wage rate of $23.15 while women work 36.47 hours with an average hourly wage of $18.58
- This sample can be described as predominantly non-Hispanic white, South residents, married and mostly privately insured, high income and having high school and GED education, aged 40.17 years and predominantly middle aged women with good health.

	Male						**Female**					
	Non-cancer			Cancer			Non-Cancer			Cancer		
	Mean (SD)	Min	Max	Mean (SD)	Min	Max	Mean (SD)	Min	Max	Mean (SD)	Min	Max
Hourly wage	20.4 (13.1)	1	79.6	25.9 (12.1)	1	79.6	17.6 (11.3)	1	79.6	19.57 (12)	1.19	73.3
Log family income	9.94 (0.84)	5.4	12.7	10.31(0.79)	6.9	12.3	9.86 (088)	4.8	12.7	10.12 (0.87)	6.02	12.2
Weekly hours worked	40.5 (10.7)	1	119	41.5 (10.9)	1	96	36.17(10.55)	1	102	36.77	2	88
Annual work loss days	0.50 (3.1)	0	112	1.14 (7.0)	1	65	0.86 (5.3)	1	120	1.87(6.0)	1	153
Age	39.39 (13)	18	64	53 (10)	18	64	39.87 (12.9)	18	64	49.15 (11.2)	18	64
Number of co-morbidity	0.67 (1.05)	0	9	1.58 (1.66)	0	9	0.73(1.01)	0	9	1.41(1.5)	0	9

GED: General educational Development; HS: High school; MEPS: Medical Expenditure Panel Survey; Weighted means of continuous variables are represented for national representativeness

Results

Table I. Marginal effects of cancer survivorship on employment [a]

	Probit model (Cross section)	Fixed-effect (Panel)	Correlated Random-effect model (Panel)
Panel 1: Male only			
Male-Specific cancers	-0.0697***	-0.0381*	-0.0170**
	(0.0232)	(0.0223)	(0.00654)
All cancers	-0.0582***	-0.0470***	-0.0392
	(0.0162)	(0.0148)	(0.0578)
Panel 2: Female only			
Female-Specific cancers	-0.0473**	-0.0458***	-0.102*
	(0.0194)	(0.0159)	(0.0537)
All cancers	-0.0514***	-0.0454***	-0.0915***
	(0.0161)	(0.0129)	(0.0275)
Panel 3: All sample			
Cancer	-0.0569***	-0.0476***	-0.0755**
	(0.0111)	(0.00971)	(0.0313)

[a]the control variables include: sex, race/ethnicity, age and its square; marital status, education attainment, census regions, health status, number of co-morbidities; log of family income normalized by family size (Adjusted for 2014 USD) and year dummies. Male-specific cancers are Prostate and Testis cancers while female-specific cancers include Breast, Ovary, Uterus and Cervix. Standard errors are shown in parentheses and balanced repeated replication technique is used to adjust for MEPS complex survey. *** $p<0.01$, ** $p<0.05$, * $p<0.1$ show significance test levels.

Results-cont.

Table II. Marginal effect of cancer survivorship on weekly hours of work [b]

Work hours (Continuous variable)	OLS model (Cross section)	FE Model	CRE model
Panel 1: Male only			
Male-Specific cancers	3.260**	1.358*	3.072+
	(1.376)	(0.715)	(1.899)
All cancers	1.091	0.208	1.925
	(0.801)	(0.479)	(1.672)
Panel 2: Female only			
Female-Specific cancers	-0.603	-0.749*	3.143**
	(0.514)	(0.423)	(1.586)
All cancers	-0.300	-0.0679	-1.697**
	(0.434)	(0.340)	(-0.742)
Panel 3: All sample			
Cancer	0.161	-0.00580	1.739*
	(0.392)	(0.280)	(1.012)

[b] The control variables, are: sex; race/ethnicity, age and its square; marital status, educational attainment, Census regions, health status number of co-morbidities; log of family income normalized by family size (Adjusted for 2014 USD); type of organization (public, private); industry indicator, labor union status and year dummies. Male-specific cancers are Prostate and Testis cancers while female-specific cancers include Breast, Ovary, Uterus and Cervix. Standard errors are shown in parentheses and balanced repeated replication technique is used to adjust for MEPS complex survey. *** $p<0.01$, ** $p<0.05$, * $p<0.1$ show significance test levels.

Results-cont.

Table III. Marginal effect of cancer survivorship on log-hourly wage [c]

Work hours (Continuous variable)	OLS model	FE Model	CRE model
Panel 1: Male only			
Male-Specific cancers	0.0997***	1.062*	0.981
	(0.0365)	(0.0330)	(0.0806)
All other cancers	0.0407	1.026	0.967
	(0.0279)	(0.0212)	(0.0705)
Panel 2: Female only			
Female-Specific cancers	-0.0152	1.011	1.075
	(0.0253)	(0.0184)	(0.0742)
All other cancers	-0.00592	1.009	1.082
	(0.0219)	(0.0148)	(0.0679)
Panel 3: All sample			
Cancer	0.00713	1.010	1.021
	(0.0174)	(00121)	(0.0487)

[c] The control variables, are: sex, race/ethnicity, age and its square; marital status, educational attainment, census regions, health status number of co-morbidities; log of family income normalized by family size (Adjusted for 2014 USD); type of organization (public, private); industry indicator; labor union status; and cancer treatment and year dummies. Male-specific cancers are Prostate and Testis cancers while female-specific cancers include Breast, Ovary, Uterus and Cervix. Standard errors are shown in parentheses and balanced repeated replication technique is used to adjust for MEPS complex survey. *** $p<0.01$, ** $p<0.05$, * $p<0.1$ show significance test levels.

Results-cont.

Table IV. Marginal effect of cancer survivorship on employed workers Absenteeism [d]

Variable	Cross sectional models		Panel models	
	Probit model	ZTNH model	RE probit model	Over-dispersion RE
Panel 1: Male only				
All cancers	0.00476 (0.0144)	0.0896 (0.0861)	0.0205 (0.0253)	1.099 (0.136)
Panel 2: Female only				
All cancers	0.0487*** (0.0129)	0.215** (0.105)	0.140* (0.0727)	1.334*** (0.0979)
Panel 3: All sample				
Cancer	0.0301*** (0.00936)	0.0900 (0.0672)	0.176*** (0.0676)	1.260*** (0.0790)

[d] the control variables, are: sex; race/ethnicity, age and its square; marital status, educational attainment, Census regions, health status, number of co-morbidities; the log of family income normalized by family size (Adjusted for 2014 USD); type of organization (public, private); industry indicator; labor union status; and cancer treatment and year dummies. Male-specific cancers are Prostate and Testis cancers while female-specific cancers include Breast, Ovary, Uterus and Cervix. Estimates of probit, zero-truncated negative binomial hurdle (ZTNH) for cross sectional data and RE probit and overdispersion RE models for the panel data are given. Standard errors are shown in parentheses and balanced repeated replication technique is used to adjust for MEPS complex survey. *** $p<0.01$, ** $p<0.05$, * $p<0.1$ show significance test levels.

Results-cont.

Table V. Annual work absenteeism costs associated with cancer survivorship in the US for employed adult age 18-64

Year	Employed male survivor	Employed female survivor	Absenteeism cost for male (billion)	Absenteeism cost for female (billion)
2008	960,172	1,615,321	[2.107-2.211]	[10.896-11.001]
2009	1,141,450	2,191,232	[2.502-2.987]	[14.729-16.123]
2010	947,036.11	2,059,892	[2.173-3.020]	[13.853-13.987]
2011	1,220,015	1,784,042	[2.753-2.965]	[12.04-12.712]
2012	1,106,181	1,811,558	[2.42-3.117]	[12.276-13.541]
2013	1,176,227	2,116,928	[2.675-3.456]	[14.274-15.321]
2014	1,261,346	1,961,040	[2.894-3.7650]	[13.269-14.761]

All costs are adjusted for 2014 US$ using the Consumer Price Index (CPI). The 95% confidence interval is given for the mean cost of absenteeism for both genders.

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Robustness checks

- We re-estimated the models with interaction between cancer survivorship and age categories , education, marital status, income and type of occupation.
- We excluded a number of job market variables (hourly wage, type of occupation, firm size, labor union membership, type of organization).
- We tested a hypothesis that employment and work hours differentials arise because a cancer survivor with a part-time job is not attached to job market as a full time employee.
- Finally, to check if the estimated differentials between model results are due to functional form or unobserved characteristics, we estimate cross sectional models by including quadratic and cubic terms of continuous variables

Conclusions and implications

- We analyze the labor market effects of gender-specific cancer survivorship for the U.S. population
- We implement correlated and over-dispersion random effects modeling strategies.
- Cancer survivorship has negative effects both on extensive and intensive margins.
- Cancer survivorship increases both probability and number of missing working days in a larger extent for females compared to males.
- Protection of cancer survivors in the labor market and improvement in the preventive and treatment measures to lower cancer associated costs

Thank you!