Impact of Cancer, Cancer Directed Therapy and Its Lasting Effects on Employment and Finances in Young Adult Cancer Survivors

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A thesis

submitted in partial fulfillment of the

requirements for the degree of

Master of Science

University of Washington

2018

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Program Authorized to Offer Degree:

Epidemiology

University of Washington

Abstract

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Background: Young adult (YA) cancer survivors face challenges unique from survivors of childhood cancer or older adults. The potential impact of cancer or its treatment upon employment and financial burden in YAs are not fully known.

Methods: We conducted a multi-center, cross-sectional study of YA cancer survivors. Eligibility included diagnosis of malignancy between ages 18-39, 1-5 years from diagnosis and ≥1 year from therapy completion. Participants were randomly selected from tumor registries of 7 participating sites and asked to complete an online patient reported outcomes (PRO) survey. Diagnostic/treatment data were abstracted from medical records. Data were analyzed all together and separately by tumor site, including: 1) breast, 2) thyroid, 3) leukemia and lymphoma, 4) and all other cancer sites. Associations of therapeutic course with PROs were analyzed using logistic regression, and Wald based 95% confidence intervals (CI) with adjustment for age (categorized), gender (except for breast cancer), and other appropriate treatment exposures.

Results: Study participants included 872 survivors (N_{breast}=209, $N_{thyroid}$=104, $N_{lymphoma}$=91, &

N_{other}=332). Most survivors (84.4%) reported working for pay at some time between diagnosis and survey completion. Exposure to chemotherapy was associated with an increased risk of mental impairment of work tasks in breast cancer survivors (OR 2.77, CI 1.39-5.53) and 'other' cancer survivors (OR 3.68, CI 2.18-6.21); in survivors of 'other' cancers, chemotherapy was also associated with increased risk of taking any time off work (OR 5.24, CI 2.66-10.32) and borrowing greater than $10,000 (OR 3.29, CI 1.53-5.98). Exposure to radiation was associated with an overall increased risk of mental impairment of work tasks (OR 1.92, CI 1.06-3.49), and of taking an extended paid time off work in YA thyroid cancer survivors (OR 2.52, CI 1.02-6.21) and leukemia & lymphoma survivors (OR 5.48, CI 1.48-20.32). Finally, exposure to having had a surgical procedure was associated with an increased risk of physical impairment (OR 2.11, CI 1.02-4.36) and mental impairment (OR 2.01, CI 1.03-3.92) of work tasks in 'other' cancer survivors.

Conclusions: In YA survivors, cancer treatment has a significant impact on the physical and mental activities of their jobs and time off from work. Our study suggest that further longitudinal studies and interventions are needed to describe and support YA cancer survivors in the work-force during and after cancer-directed therapy.

University of Washington

Thesis

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BACKGROUND

The incidence of cancer in adolescents and young adults (AYA) ages 15 to 39 years has steadily increased over the past 25 years, and cancer remains a leading cause of non-accidental death in this age group (1). Despite advances in cancer prevention, early detection, and treatment over the past several decades, survival rates for AYAs have not improved to the extent they have for younger children or older adult cancer populations (2,3). AYA survival is often accompanied by ongoing physical, mental, social and emotional challenges such as physical impairment, infertility, uncertainty, fears about recurrence, interruption of life plans, and discrimination in employment and insurance (4,5).

It has been described that AYAs with a history of cancer are more likely to not be working due to illness as compared to controls (6). It has also been reported that AYA survivors who had pursued careers involving physical abilities before cancer diagnosis often believe that they need to adjust their goals as a result of their cancer (7). In addition, AYAs have higher direct annual medical costs ($7417 vs $4247 for adults without a cancer history), experience annual average lost productivity costs due to illness/disability of $2200 per year, and have lower family incomes compared with similar-age adults without cancer (6). These disparate outcomes in the AYA population are likely related to the distinctive challenges, transitions and choices related to education, employment, identity, relationships and family experienced by the AYA survivor population. Furthermore, this population may be challenged by physical deformities in the midst of a period of life in which body image is critical to sense of self.

Whereas there exists extensive literature regarding long term outcomes in survivors of childhood cancer and a growing amount of literature in survivors of cancers that typically occur in middle to older age adults, there is a paucity of information available regarding the long-term and late effects that may be unique to cancer survivors diagnosed and treated in young adulthood. Young adult (YA) cancer survivors, aged 18-39 years at cancer diagnosis, face many challenges that are unique to their age group, such as return to work / school and financial distress, which can contribute to psychological and health-related adverse outcomes. Understanding how cancer-related challenges manifest needs and desires for psychological and social support services throughout a continuum of care may help clinicians improve cost-effective quality care and patient outcomes.

Beginning in 2004, the LIVESTRONG (LS) Foundation has provided grant funding that established the Survivorship Center of Excellence Network (SCOEN). Through regular meetings, working groups and joint projects, the SCOEN sought to harness the expertise, experience, creativity and productivity of leading centers in an effort to significantly accelerate progress in the field of cancer survivorship. One tool developed from this group to assess the current state and needs of YA cancer survivors was the LIVESTRONG Survey for People Affected by Cancer. This survey asks questions about how cancer has impacted the life of YA cancer survivors. To develop this survey, LS coordinated with National Cancer Institute (NCI), Office of Behavioral and Social Sciences Research (OBSSR), Center for Disease Control (CDC), American Cancer Society (ACS), and Agency for Healthcare Research and Quality (AHRQ) to include elements of the Experiences with Cancer Survivorship supplement of the Medical Expenditures Panel Survey (MEPS).

To address the gap in knowledge regarding the long-term and late effects of cancer in the YA population, we leveraged the LIVESTRONG Survey for People Affected by Cancer, paired with treatment data abstracted from medical records, to evaluate the impact of cancer-directed treatment with respect to physical or mental impairment of work related tasks, the need for paid or unpaid time off from work, and the financial toxicity for YA cancer survivors or their family due to cancer or its treatment.

METHODS

Recruitment, Study Setting and Participants

This is a multi-center, cross-sectional study of young adult cancer survivors. The SCOEN is

composed of 7 geographically diverse participating sites, including the Fred Hutchinson Cancer Research Center/Seattle Cancer Care Alliance, Seattle WA, Abramson Cancer Center, University of Pennsylvania, Philadelphia PA, Dana Farber Cancer Institute, Boston MA, Jonsson Comprehensive Cancer Center, UCLA, Los Angeles CA, University of Colorado Cancer Center, Denver CO, and the University of North Carolina, Chapel Hill NC. Eligibility for study participation included a diagnosis of malignancy between ages 18-39 years and survey completion within 1-5 years from diagnosis and >1 year from therapy completion. Participants were sent a recruitment letter and brochure; if participants did not respond, they were sent a second recruitment letter 7-10 days after the initial letter, and were called up to 5 times with up to 3 voice mail contacts or voice messages attempted. Those participants who agreed to participation were then sent an email to complete the study consent online. Once consented to participate, enrolled participants were directed to a unique URL containing the LS Survey.

Assessment of Physical, Mental and Financial Effects

Participants were asked to complete an online survey of patient reported outcomes (PRO). Questions from the PRO survey related to physical and mental impairment of work related tasks, extended paid or unpaid time off from work, and cancer survivors or their family borrowing money or going into debt. For the present investigation, we focused on responses to the following subset of questions: (1) Did you ever feel that your cancer, its treatment, or the lasting effects of that treatment interfered with your ability to perform any physical tasks required by your job? (2) Did you ever feel that your cancer, its treatment, or the lasting effects of that treatment interfered with your ability to perform any mental tasks required by your job? (3) At any time since your first cancer diagnosis, did you take extended paid time off from work,

unpaid time off, or make a change in your hours, duties or employment status? (4) Did you ever take extended paid time off work (vacation, sick time and/or disability leave)? (5) Did you ever take unpaid time off from work? and (6) How much did you or your family borrow, or how much debt did you incur because of your cancer, its treatment, or the lasting effects of that treatment?

Treatment Exposures

Diagnostic and treatment data were abstracted from medical records using a standardized protocol. Treatment data were collected, including information regarding surgery, chemotherapy and/or radiation. Patient reported treatment data was also collected and was used when treatment data was otherwise incomplete or missing.

Covariates

Potential confounders of the associations between cancer-directed treatment exposure and physical, mental and financial outcomes were selected *a priori*, based on literature review, and included gender and age at diagnosis (categorized as 18-24, 25-35, or >35 years of age).

Statistical Analyses

Data were analyzed separately by tumor site, including: 1) breast, 2) thyroid, 3) leukemia and lymphoma, 4) and all other cancer sites. Within each tumor site, the PROs were analyzed using logistic regression; Wald based 95% confidence intervals (CI) were generated for all associations. Analyses of each cancer-directed treatment exposure (surgery vs. no surgery, chemotherapy vs. no chemotherapy, radiation vs. no radiation) were controlled for age (by

category). With the exception of breast cancer-specific analyses, regression models were also adjusted for gender. Greater than 95% of breast cancer survivors underwent surgery as part of their treatment course; therefore, analyses among breast cancer survivors were controlled for treatment exposures other than surgery (chemotherapy or radiation). Similarly, greater than 90% of leukemia and lymphoma survivors were exposed to chemotherapy and, therefore, analyses within this survivor population were adjusted for radiation or surgery, but not for chemotherapy. Analyses were limited to enrolled study participants who completed the PRO survey. All analyses were performed in R version 3.3.0.

RESULTS

There were a total of 2005 eligible participants from 7 different participating study sites. Among those who were eligible, 56.4% (N=1130) patients were registered for the study, of whom 872 completed the survey (Figure 1). Of the participants who completed the PRO survey, 635 participants were female and 237 were male, with a median age at diagnosis of 32.3 and 29.8 years respectively; 80.6% of participants were white (Table 1).

Overall, 84.6% of participants were working for pay at a job or business any time from diagnosis with cancer until study participation. Among YA survivors who were working and reported physical tasks associated with their jobs, those exposed to chemotherapy were significantly more likely to report interference with physical tasks required by their job (OR 1.82, CI 1.15-2.89, $p<0.05$), compared to survivors who did not receive chemotherapy, adjusting for radiation and surgery exposure, as well as age at diagnosis and gender (Table 2); receipt of chemotherapy was also significantly associated with reported interference with mental tasks required by a job (OR

3.28, CI 2.22-4.85, p<0.01) and any time off from work (3.46, CI 2.26-5.30, p<0.05). Radiation and surgery were also associated with increased odds of these outcomes, although associations were much weaker and, with the exception of the association between radiation and interference with physical tasks at work, these associations were not statistically significant. YA survivors who were exposed to chemotherapy were significantly more likely to report that they or their families borrowed greater than $10,000 (OR 3.03, CI 1.50-5.98, p<0.01) compared to survivors not exposed to chemotherapy with the same gender, age (categorical), radiation and surgery exposure. (Table 4) A total of 13 YA survivors reported that they or their family ever filed for bankruptcy because of their cancer, its treatment, or the lasting effects of that treatment; due to the rare nature of this outcome, we did not evaluate associations with treatment modalities.

Breast Cancer

In total, 241 participants who completed the PRO survey had a diagnosis of breast cancer, of whom 209 (86.7%) were working for pay at a job or business any time from diagnosis with cancer until study participation. Among survivors who were working, those who were exposed to chemotherapy were significantly more likely to report interference with mental tasks required by their job (OR 2.77, CI 1.39-5.53, p,<0.01) compared to those not exposed to chemotherapy (Table 3). Also, those exposed to radiation were significantly more likely to report interference with mental tasks required by their job (OR 1.9, CR 1.06-3.49, p<0.05) compared to those not exposed to radiation. We did not find an association with cancer-directed treatment exposure and the ability to perform physical tasks required by a job, nor did we observe associations with extended paid time off from work, unpaid time off, or a change in hours, duties or employment

status in YA breast cancer survivors.

Leukemia and Lymphoma

Of the 163 survey participants who had a diagnosis of leukemia or lymphoma, 130 (79.8%) were working for pay at a job or business any time from diagnosis with cancer until study participation. No association was found between cancer-directed treatment exposures and interference with physical or mental task required by their job among working leukemia and lymphoma survivors (Table 5). In this group, survivors exposed to radiation were significantly more likely to report taking extended paid time off from work (OR 2.52, CI 1.02-6.21, $P<0.05$) compared to those who were not exposed to radiation. There was no association between cancer-directed treatment exposures and unpaid time off from work.

Thyroid Cancer

126 participants who completed the PRO survey had a diagnosis of thyroid cancer, of whom 104 (82.5%) were working for pay at a job or business any time from diagnosis with cancer until study participation. No association was found between cancer-directed treatment exposures and interference with physical or mental task required by their job in patients in thyroid cancer survivors (Table 6). Among thyroid cancer survivors who were working, those survivors exposed to radiation were significantly more likely to report taking extended paid time off from work (OR 5.48, CI 1.48-20.32, $P<0.05$) than those who were not exposed to radiation. There was no association between cancer-directed treatment exposures and interference with paid or unpaid time off from work, nor was there an association between cancer-directed treatment exposure and YA leukemia and lymphoma survivors or their families borrowing greater than $10,000.

Other Cancers

The remaining 328 participants who completed the PRO survey had a diagnosis other than breast cancer, leukemia, lymphoma or thyroid cancer, of whom 281 (85.7%) were working for pay at a job or business any time from diagnosis with cancer until study participation. Among survivors who were working, those who were exposed to chemotherapy were significantly more likely to report interference with mental tasks required by their job (OR 3.68, CI 2.18-6.21, $p < 0.01$) and taking paid time off from work (OR 5.24, CI 2.66-10.32, $p<0.05$) compared to those not exposed to chemotherapy (Table 7). Survivors exposed to radiation were significantly more likely to report taking extended paid time off from work, unpaid time off, or make a change in their hours, duties or employment status (OR 2.48, CR 1.12-5.49, $p<0.05$). Furthermore, among survivors who were working, those who underwent surgery were significantly more likely to report interference with mental tasks required by their job (OR 2.01, CI 1.03-3.92, $p < 0.05$) compared to those who did not undergo surgery with the same gender, age (categorical), chemotherapy and radiation exposure. Finally, YA survivors who were exposed to chemotherapy were significantly more likely to report that they or their families borrowed greater than $10,000 (OR 3.20, CI 1.48-7.33, $p<0.01$) compared to survivors not exposed to chemotherapy with the same gender, age (categorical), radiation and surgery exposure.

DISCUSSION

In this cross-sectional study of YA cancer survivors, we found that exposure to chemotherapy was associated with an increased odds of mental impairment of work tasks in YA breast and 'other' cancer survivors, an increased odds of taking any time off work in YA 'other' cancer

survivors, and an increased odds of YA 'other' cancer survivors or their families borrowing greater than $10,000. Exposure to radiation therapy was associated with an increased odds of mental impairment of work tasks in YA breast cancer survivors, and an increased odds of taking an extended paid time off work in YA thyroid cancer and leukemia & lymphoma survivors. Finally, the exposure to having had a surgical procedure was associated with an increased risk of physical and mental impairment of work tasks in 'other' cancer survivors.

Although there is a considerable amount of research specifically addressing cancer and work outcomes, most have focused on the likelihood and timeliness of work return after cancer (8,9). Prior data in breast cancer patients has indicated that the type of treatment is the principal determinant in the time taken to return to work (10). A study of Korean breast cancer survivors showed that fatigue and exhaustion were the most frequent difficulties encountered by survivors during occupational work (11). Our study fills a gap in the literature as it relates to YA cancer survivors and the impact of cancer-directed therapies on employment and financial outcomes in YA cancer survivors and the physical and mental impairment they may face.

YA cancer survivors are a heterogeneous group and therefore the treatments, and morbidities from their treatment, are also likely to be heterogeneous. It is possible that the associations we see in each of the different cancer categories are related to advanced disease requiring intensification of therapy. For example, in the group with a diagnosis other than breast cancer, leukemia, lymphoma or thyroid cancer, the association of radiation and physical limitations at work may be due to radiation exposure related to treatment of brain tumors included in this group.

The results of this study should be interpreted in the context of study limitations. As this is a one-time, cross-sectional study, our results do not capture the trajectories of impairments in the cancer survivor population. We also lacked information regarding the participant's insurance status as this may the impact financial impact on survivors. Further, there were limitations related to the lower study enrollment rate of 43.7%; although this presents the possibility of selection bias and could impact generalizability, this response rate is similar to that observed in other studies of adolescent and young adults cancer survivors such as the AYA Health Outcomes and Patient Experience (HOPE) Study (12). We acknowledge that there is potential for selection bias in this study as the survivors who are not completing the survey may be systematically different from those who have completed the survey with respect to the outcomes. Finally for analyses of exposure to chemotherapy, there was not sufficient power or data to distinguish participants according to chemotherapy regimen as it is possible that some chemotherapy regimens may have more long-term consequences than others.

In summary, our study is the first to our knowledge to describe associations of cancer-directed therapy on employment and financial implications in a multi-center, large cohort of YA cancers survivors. This work is important in understand the challenges unique to YA cancer survivors as it relates to their employment during and after their cancer therapy. The results from our study suggest that further longitudinal studies and interventions are needed to describe and support YA cancer survivors in the work-force during and after cancer-directed therapy.

Acknowledgements: This investigation was supported by the National Institutes of Health under Ruth L. Kirschstein National Research Service Award T32CA009351. The authors report no conflict of interest.

Table 1: Characteristics of young adult survivors by gender

	Female	Male
n	635	237
Age at Diagnosis (mean (sd))	32.3 (5.62)	29.8 (6.09)
Age Category at Diagnosis (n (%))		
18-24	84 (13.2)	55 (23.2)
25-34	306 (48.2)	122 (51.5)
35-39	245 (38.6)	60 (25.3)
EthnicityDesc (%)		
Not Hispanic or Latino	577 (90.9)	212 (89.5)
Hispanic or Latino	49 (7.7)	23 (9.7)
Declined/Unknown	9 (1.4)	2 (0.8)
Race (%)		
White	504 (79.4)	199 (84.0)
Asian/Pacific Islander	57 (9.0)	21 (8.9)
Black	43 (6.8)	6 (2.5)
Deferred/NA	31 (4.9)	11 (4.6)
Diagnosis (%)		
Breast	240 (37.8)	1 (0.4)
Leukemia & Lymphoma	83 (13.1)	80 (33.8)
Endocrine system	108 (17.0)	20 (8.4)
Skin	60 (9.4)	21 (8.9)
Genital system - Female	48 (7.6)	1 (0.4)
Genital system - Male	0 (0.0)	46 (19.4)
Brain & other nervous system	24 (3.8)	17 (7.2)
Bones & Soft Tissue	17 (2.7)	19 (8.0)
Digestive system	24 (3.8)	11 (4.6)
Oral cavity & pharynx	13 (2.0)	12 (5.1)
Urinary system	8 (1.3)	6 (2.5)
Other	10 (1.6)	3 (1.3)

Table 2: Association of cancer directed treatment factors and physical and mental impairment at work, and change in employment among young adult cancer survivrs working at any time from diagnosis to study participation.

	Chemotherapy #			Radiation ^			Surgery @		
	n Chemotherapy/ n no Chemotherapy	OR	95% CI	n Radiation/ n no Radiation	OR	95% CI	n Surgery/ n no Surgery	OR	95% CI
Interfered with physical tasks required by job									
No	96 / 119	1.00	Ref	80 / 135	1.00	Ref	172 / 43	1.00	Ref
Yes	187 / 115	1.82	(1.15-2.89) *	140 / 162	1.15	(1.05-2.33) *	240 / 62	1.55	(0.90-2.66)
Interfered with mental tasks required by job									
No	144 / 189	1.00	Ref	122 / 211	1.00	Ref	264 / 69	1.00	Ref
Yes	269 / 130	3.28	(2.22-4.85) **	182 / 217	1.31	(0.94-1.83)	321 / 78	1.44	(0.90-2.32)
Extended paid time off from work, unpaid time off, or a change in your hours, duties or employment status									
No	64 / 108	1.00	Ref	63 / 109	1.00	Ref	137 / 35	1.00	Ref
Yes	352 / 212	3.46	(2.26-5.30) **	243 / 321	1.11	(0.76-1.62)	452 / 112	1.23	(0.72-2.10)
Extended paid time off from work									
No	115 / 63	1.00	Ref	77 / 101	1.00	Ref	143 / 35	1.00	Ref
Yes	228 / 138	1.09	(0.67-1.76)	165 / 201	1.01	(0.68-1.50)	293 / 73	0.54	(0.29-1.01)
Unpaid time off from work									
No	159 / 96	1.00	Ref	119 / 136	1.00	Ref	199 / 56	1.00	Ref
Yes	183 / 103	1.25	(0.80-1.98)	122 / 164	0.92	(0.64-1.33)	234 / 52	1.33	(0.77-2.30)

Adjusted for age (categorical), gender, radiation status and surgery status.

^ Adjusted for age (categorical), gender, chemotherpy status and surgery status.

@ Adjusted for age (categorical) gender, chemotherapy status and radiation status.

* p-value <0.05

** p-value <0.01

Table 3: Association of cancer directed treatment factors and physical and mental impairment at work, and change in employment among young adult breast cancer survivors working at any time from diagnosis to study participation.

	Chemotherapy #			Radiation ^		
	n Chemotherapy/ n no Chemotherapy	OR	95% CI	n Radiation/ n no Radiation	OR	95% CI
Interfered with physical tasks required by job						
No	42 / 17	1.00	Ref	33 / 26	1.00	Ref
Yes	66 / 13	1.82	(0.75-4.41)	47 / 32	1.09	(0.53-2.27)
Interfered with mental tasks required by job						
No	57 / 33	1.00	Ref	41 / 49	1.00	Ref
Yes	100 / 18	2.77	(1.39-5.53) **	77 / 41	1.92	(1.06-3.49) *
Extended paid time off from work, unpaid time off, or a change in your hours, duties or employment status						
No	29 / 13	1.00	Ref	27 / 15	1.00	Ref
Yes	129 / 38	1.76	(0.78-3.93)	91 / 76	0.60	(0.28-1.26)
Extended paid time off from work						
No	38 / 8	1.00	Ref	36 / 10	1.00	Ref
Yes	88 / 28	1.08	(0.41-2.83)	55 / 61	0.24	(0.10-0.58) **
Unpaid time off from work						
No	60 / 25	1.00	Ref	44 / 41	1.00	Ref
Yes	65 / 11	2.23	(0.62-2.40)	46 / 30	1.22	(0.62-2.40)

Adjusted for age (categorical) and radiation status

^ Adjusted for age (categorical) and chemotherapy status

* p-value <0.05

** p-value <0.01

Table 4: Association of Treatment Factors and YA surivors or their families borrowing greater than $10,000 because of cancer, its treament or lasting effects of treatment stratified by diagnosis.

	Chemotherapy #			Radiation ^			Surgery @		
	n Chemotherapy/ n no Chemotherapy	OR	95% CI	n Radiation/ n no Radiation	OR	95% CI	n Surgery/ n no Surgery	OR	95% CI
All Diagnosis									
No	67 / 73	1.00	Ref	56 / 84	1.00	Ref	106 / 34	1.00	Ref
Yes	85 / 41	3.03	(1.53-5.98) **	54 / 72	0.98	(0.57-1.70)	95 / 31	1.02	(0.50-2.06)
Breast Cancer									
No	21 / 9	1.00	Ref	17 / 13	1.00	Ref	- -	- -	- -
Yes	30 / 3	4.61	(0.86-24.68)	20 / 13	0.81	(0.24-2.75)	- -	- -	- -
Leukemia & Lymphoma									
No	- -	- -	- -	10 / 15	1.00	Ref	6 / 19	1.00	Ref
Yes	- -	- -	- -	6 / 14	0.58	(0.13-2.63)	7 / 13	2.45	(0.49-12.08)
Thyroid Cancer									
No	- -	- -	- -	12 / 10	1.00	Ref	- -	- -	- -
Yes	- -	- -	- -	9 / 6	1.23	(0.25-6.04)	- -	- -	- -
Other									
No	22 / 41	1.00	Ref	17 / 46	1.00	Ref	50 / 13	1.00	Ref
Yes	37 / 21	3.29	(1.48-7.33) **	19 / 39	1.06	(0.43-2.59)	43 / 15	0.88	(0.36-2.14)

Adjusted for age (categorical), gender (except breast), radiation status and surgery status (except breast).

^ Adjusted for age (categorical), gender (except breast), chemotherpy status (except leukemia & lymphoma and thyroid) and surgery status (except breast and thyroid).

@ Adjusted for age (categorical) gender (except breast), chemotherapy status (except leukemia and lymphoma) and radiation status.

* p-value <0.05

** p-value <0.01

Table 5: Association of cancer directed treatment factors and physical and mental impairment at work, and change in employment among young adult survivors of leukemia or lymphoma working at any time from diagnosis to study participation.

	Radiation #				Surgery ^			
	n Radiation/ n no Radiation	OR	95% CI		n Surgery/ n no Surgery	OR	95% CI	
Interfered with physical tasks required by job								
No	13 / 13	1.00	Ref		6 / 20	1.00	Ref	
Yes	27 / 29	0.90	(0.32-2.54)		20 / 36	1.90	(0.60-5.96)	
Interfered with mental tasks required by job								
No	25 / 26	1.00	Ref		15 / 36	1.00	Ref	
Yes	29 / 49	0.61	(0.30-1.29)		25 / 53	1.18	(0.51-2.68)	
Extended paid time off from work, unpaid time off, or a change in your hours, duties or employment status								
No	12 / 12	1.00	Ref		7 / 17	1.00	Ref	
Yes	43 / 63	0.60	(0.26-1.72)		34 / 72	0.90	(0.30-2.69)	
Extended paid time off from work								
No	13 / 31	1.00	Ref		18 / 26	1.00	Ref	
Yes	29 / 30	2.52	(1.02-6.21)	*	15 / 44	0.39	(0.15-1.03)	
Unpaid time off from work								
No	25 / 28	1.00	Ref		14 / 39	1.00	Ref	
Yes	17 / 33	0.57	(0.25-1.32)		19 / 31	1.79	(0.72-4.45)	

Adjusted for age (categorical), gender and surgery status

^ Adjusted for age (categorical), gender and radiation status

* p-value <0.05

** p-value <0.01

Table 6: Association of cancer directed treatment factors and physical and mental impairment at work, and change in employment among young adults survivors of thyroid cancer working at any time from diagnosis to study participation.

	Radiation #		
	n Radiation/ n no Radiation	OR	95% CI
Interfered with physical tasks required by job			
No	20 / 21	1.00	Ref
Yes	21 / 12	2.01	(0.70-5.80)
Interfered with mental tasks required by job			
No	28 / 27	1.00	Ref
Yes	29 / 20	1.46	(0.64-3.33)
Extended paid time off from work, unpaid time off, or a change in your hours, duties or employment status			
No	14 / 15	1.00	Ref
Yes	43 / 32	1.47	(0.59-3.63)
Extended paid time off from work			
No	8 / 13	1.00	Ref
Yes	35 / 15	5.48	(1.48-20.32) *
Unpaid time off from work			
No	22 / 15	1.00	Ref
Yes	21 / 13	1.09	(0.38-3.08)

Adjusted for age (categorial) and gender.

* p-value <0.05

** p-value <0.01

Table 7: Association of cancer directed treatment factors and physical and mental impairment at work, and change in employment among young adults cancer survivors other than breast cancer, leukemia, lymphoma or thyroid cancer working at any time from diagnosis to study participation.

	Chemotherapy #			Radiation ^			Surgery @		
	n Chemotherapy/ n no Chemotherapy	OR	95% CI	n Radiation/ n no Radiation	OR	95% CI	n Surgery/ n no Surgery	OR	95% CI
Interfered with physical tasks required by job									
No	31 / 58	1.00	Ref	14 / 75	1.00	Ref	68 / 21	1.00	Ref
Yes	68 / 66	1.58	(0.85-2.91)	45 / 89	2.81	(1.32-6.02)	113 / 21	2.11	(1.02-4.36) *
Interfered with mental tasks required by job									
No	40 / 97	1.00	Ref	28 / 109	1.00	Ref	107 / 30	1.00	Ref
Yes	95 / 59	3.68	(2.18-6.21) **	47 / 107	1.45	(0.79-2.67)	134 / 20	2.01	(1.03-3.92) *
Extended paid time off from work, unpaid time off, or a change in your hours, duties or employment status									
No	14 / 63	1.00	Ref	10 / 67	1.00	Ref	60 / 17	1.00	Ref
Yes	122 / 94	5.24	(2.66-10.32) **	66 / 150	2.48	(1.12-5.49) *	183 / 33	1.69	(0.85-3.38)
Extended paid time off from work									
No	36 / 31	1.00	Ref	20 / 47	1.00	Ref	59 / 8	1.00	Ref
Yes	83 / 58	1.14	(0.60-2.17)	46 / 95	1.10	(0.53-2.28)	118 / 23	0.70	(0.25-1.96)
Unpaid time off from work									
No	47 / 33	1.00	Ref	28 / 52	1.00	Ref	66 / 14	1.00	Ref
Yes	72 / 54	1.04	(0.57-1.92)	38 / 88	0.84	(0.44-1.62)	109 / 17	1.34	(0.58-3.07)

Adjusted for age (categorical), gender, radiation status and surgery status.

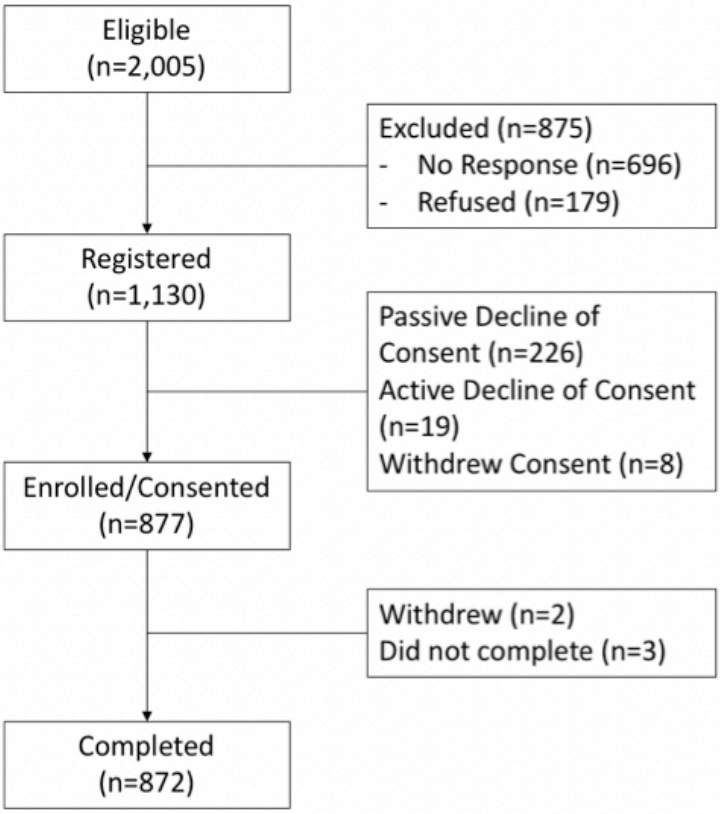
^ Adjusted for age (categorical), gender, chemotherpy status and surgery status.

@ Adjusted for age (categorical) gender, chemotherapy status and radiation status.

* p-value <0.05

** p-value <0.01

Figure 1


Eligible
(n=2,005)
Excluded (n=875)
- No Response (n=696)
- Refused (n=179)
Registered
(n=1,130)
Passive Decline of
Consent (n=226)
Active Decline of Consent
(n=19)
Withdrew Consent (n=8)
Enrolled/Consented
(n=877)
Withdrew (n=2)
Did not complete (n=3)
Completed
(n=872)

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