1. Study Title: Unemployment and occupational type among childhood cancer survivors: A report from the Childhood Cancer Survivor Study (CCSS)

2. Study Group Investigators: This proposed study will be reviewed by the Cancer Control working group. The investigators include:

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3. Background and Rationale:

This concept proposal aims to investigate the demographic, cancer, physiologic and psychosocial factors related to the work status and occupational type for adult survivors of childhood cancer. This proposal adds to the literature in several ways. Many studies report that childhood cancer survivors are less likely to work as adults, but the reasons survivors report higher levels of unemployment – such as illness or disability – have not been explored. Also, the employability of survivors is little studied. We aim to assess whether survivors are more likely to be unemployed and looking for work compared to siblings and within survivors of certain cancer types and treatments. Additionally, we are aware of no studies in the United States that have examined the occupational type of adult survivors of childhood cancers. First, we provide an overview of the literature that evaluates employment and occupational status among childhood cancer survivors. Next, we discuss the literature that examines the associations between demographic, treatment, psychosocial and health status factors, and employment status and/or occupation. The proposal is divided into three overall aims, with each aim comprising a separate manuscript.

Introduction: Since the mid-1970s, mortality for childhood cancers has decreased substantially due to new and improved treatments and advancements in supportive care.[1, 2] The overall probability of 5-year survival improved from less than 30% in 1960 to greater than 70% in 1990.[2] Although these treatments have improved survival, the surgery, chemotherapy and radiation involved in childhood cancer treatment may lead to long-term effects that continue into and progress throughout adulthood. Studies report late effects from treatment, such as neurologic and musculoskeletal impairments, that impact survivors physical, psychosocial and cognitive functioning.[3, 4] Additionally, survivors often face a higher likelihood of chronic disease or other health problems that can affect their daily lives.[5-7] For certain cancer types, such as Hodgkin's lymphoma, bone cancers and central nervous system tumors (CNS), survivors face greater risks of health status deficits and long-term complications from their treatments.[8-10]

Conceptual model of employment for childhood cancer survivors: The conceptual model for this proposal (Figure 1, p. 4) provides an overview of the many complex and interacting factors –

demographic, treatment, psychosocial, and health status – that may impact employment for adult survivors of childhood cancer. Additionally, this model helps to guide the discussion of the Background and Rationale of this study. On the far left of the model, certain demographic and cancer-related factors are related to the psychosocial and physical health of adult survivors of childhood cancer. These factors also play a role in determining other factors for these survivors as adults, such as educational attainment and marital status. On the far right, employment status and occupational type outcomes are listed, which highlight how this proposal will fill the gaps in the literature. Specifically, by examining survivors who are not employed due to illness or disability, or unemployed and looking for work, this proposal will help to explain why childhood cancer survivors are less often employed. Also, the outcome of occupational type will provide important information on whether survivors who have health limitations or other deficits are less likely to hold professional positions that require years of training, or physical labor type positions that may be too taxing for those with health problems. These employment outcomes result from the complex interaction of the demographic, cancer, physiologic and psychosocial factors. The arrows leading from the employment outcomes are bi-directional, indicating the recursive relationship between these factors, where the employment outcomes may also affect certain demographics and the psychosocial and physical health of survivors. The factors included in the conceptual model are discussed in more detail below.

Employment status of childhood cancer survivors: Although employment is often conceptualized from an economic perspective as the opportunity to make money, work also plays a key role in the well-being of individuals and communities. Social psychologists have long recognized paid work as a central social institution for individuals, where employees get a sense of collective purpose, identity and psychological benefits from participating in a regular, required activity.[11] Cancer survivors are not unlike other adults in that work plays an important role in their identity and self esteem. In addition, participating in this social role as an adult member of society can provide a sense of normalcy and competence for cancer survivors.[12]

The role of work in the lives of cancer survivors can be overshadowed by more pressing concerns regarding their health status. Because of the physical effects of childhood cancer, survivors may be less likely to work, which can impact their psychological and financial well-being. Studies of quality of life and emotional health of survivors are mixed; in general survivors do report some deficits in these outcomes compared to healthy comparison groups, although the overall proportion reporting decreased quality of life is often low.[13-16] However, survivors with reported physical functioning limitations and emotional health deficits are less likely to be employed and have lower educational attainment and incomes.[13, 17, 18] Although the vast majority of survivors report having health insurance in one CCSS analysis, survivors are also more likely to have this coverage through Medicaid or public assistance in comparison to their siblings.[19] In the United States, where 59% of insured patients in the US receive their health insurance through employer-based programs,[20] survivors who are unable to be employed may face problems obtaining or keeping their insurance coverage.

Adult childhood cancer survivors generally report lower levels of employment in contrast to healthy comparison groups, although the rates of unemployment vary across cancer types and settings. A recent meta-analysis estimated that survivors of childhood cancers are more than two times more likely to be unemployed when compared to siblings or age and sex-matched comparisons. Survivors in the meta-analysis articles were also more likely to become unemployed if residing in the United States than Europe.[21] Pang et al. examined employment among members of the CCSS cohort, comparing survivors to siblings. The overall rate of unemployment for the preceding year was generally low for

survivors (9.3%), but significantly higher than the sibling comparison group (6.7%). Survivors were 3.7 times more likely to have never been employed than members of the sibling group.[22]

Additionally, most studies that have reported and compared employment rates among childhood cancer survivors and either siblings or another population group have not evaluated the specific risk factors related to being unemployed due to illness or disability. This type of analysis will be valuable, because interventions to improve participation in this important social role can only be designed if we know the risk factors for unfavorable employment outcomes. Because of the health effects from treatment, some survivors may have educational limitations[23] or ongoing illnesses or disabilities that prevent them from working. Other survivors may consciously make different lifestyle choices, such as choosing to be a home-maker, at higher rates than non-survivors,[24] because of the impact the disease has had on their lives. Also, the employability of survivors has been little examined; some survivors may desire employment but be unable to find a job due to education or training deficiencies, or health limitations. Finally, survivors may also face outside barriers for obtaining employment.[12, 13] A review article on the quality of life for childhood cancer survivors found report of job discrimination and difficulties obtaining employment for many survivors.[13]

Occupational type of childhood cancer survivors: The occupational types of childhood cancer survivors have been little reported. Quantifying occupational type can provide important information on the lifestyles of childhood cancer survivors, because job type influences income and access to other resources throughout an individual's lifetime. Occupational type, along with income, education and other measures, is an indication of an individual's social class, which is related to health status.[25, 26] A Swedish study showed no differences in socioeconomic level as measured by occupation type between childhood cancer survivors and a healthy comparison group.[13] However, cognitive or physical problems from cancer treatment may affect survivors' ability to obtain certain occupational types, and in the Swedish study better coping was linked to higher socioeconomic level.[13] Special education services are utilized by survivors more often than controls.[23] Additionally, certain treatments for childhood cancer, such as cranial radiation, are associated with a higher risk of not completing high school or using special education services,[23, 27] all which may impact occupational type. Also, survivors may choose different career pathways as a result of life changes that arise because of their illness. For example, having a childhood disease such as cancer may influence whether a survivor decides to commit to years of school to obtain a professional degree, such as medicine or law. For survivors who work, their occupation may affect their behaviors and the resources available to them throughout their adulthood; increases in employment grade and social class are often linked to better health behaviors and health outcomes.[28, 29]

Demographic and cancer-related factors related to employment in childhood cancer survivors: Studies show potential differences in employment for childhood cancer survivors by demographic and cancer-related factors. Male survivors may be more likely to be employed compared to female, whereas survivors who were diagnosed at an earlier age or treated with radiotherapy report lower levels of employment.[21, 22, 30] Additionally, survivors of CNS and brain tumors are much more likely to be unemployed.[21, 22] For occupational type, there may be similar relationships between demographic and treatment-related factors that impact the type of occupation, although this has not been reported.

Health status and employment in childhood cancer survivors: In general, survivors of childhood cancers report good physical function and quality of life. However, functional and activity limitations do affect the daily lives of survivors more often than healthy controls.[4, 9] Additionally, survivors are

more likely to report that their health prevents school or work attendance.[3] For certain occupation types that require physical activity or years of training, survivors with ongoing physical limitations may be less likely to achieve or be able to maintain these types of jobs.

Psychosocial health and employment in childhood cancer survivors: Although overall rates of psychological distress for survivors are generally are similar to population norms, female survivors of certain cancer types report higher levels of distress or other mental health limitations.[14, 31, 32] Depression may occur more often in survivors both as adolescents and adults[31, 33] and they are also more likely to report adverse mental health.[9] Greater psychological distress is also reported for survivors of certain types of cancer if unemployed in the previous 12 months.[14, 31] These psychosocial health limitations may affect a survivors ability to be employed or maintain employment. Also, occupational type may also be associated with the psychosocial health of survivors, although we are aware of no studies that have examined this relationship.

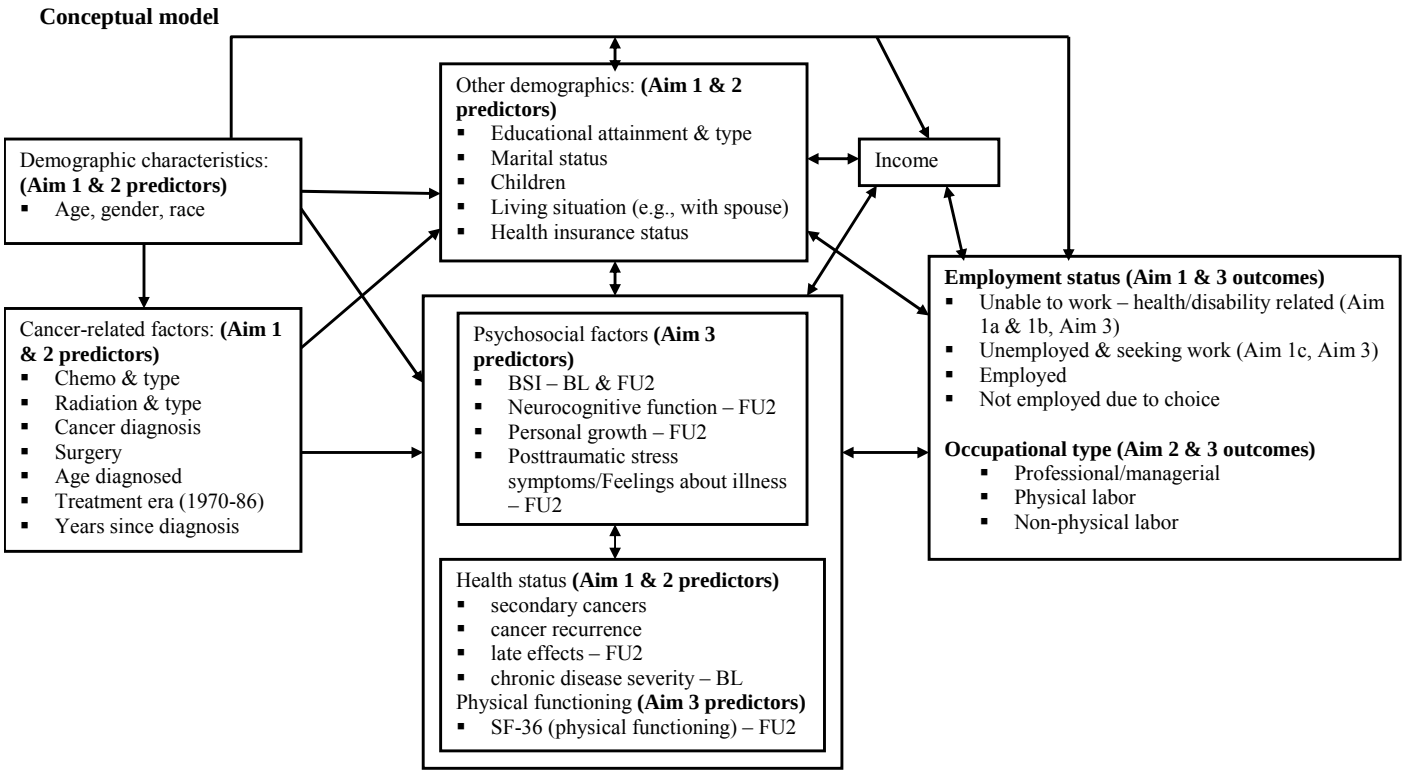
Summary: Studies indicate that childhood cancer survivors are less likely to be employed than healthy comparison groups. Few studies have assessed the risk factors for the higher prevalence of unemployment in this population and whether survivors are more likely to be unemployed due to illness or disability. The proposed study will add to the literature in several ways. First, by examining the demographic, cancer, physiologic and psychosocial factors that are associated with report of being unable to be employed due to illness or disability, we can provide a foundation for identifying survivors in need of early intervention. In this first aim, we will compare the proportion of siblings and survivors who report being unable to be employed due to illness or disability and examine specific demographic characteristics that may be important for this outcome. Within survivors, specific cancer and treatment-related variables related to being unable to be employed due to illness or disability will be tested. Second, by examining report of being unemployed and looking for work as an additional outcome, we can obtain a better picture of the employability of adult survivors of childhood cancers and whether certain cancer and treatment subgroups are at a higher risk for possible job loss compared to other types of survivors and the sibling comparison group. To provide a population-based context on employment, an age, gender and race-matched sample from the National Health and Nutrition Examination Survey will also be compared to the survivors and siblings for these employment status outcomes, along with a comparison of the proportions reporting full and part time employment and being unemployed by choice (e.g., homemaker) considering relevant covariates such as education.

Third, our study will add to the literature by providing information on the occupational types of childhood cancer survivors in Aim 2. These same demographic, cancer and treatment-related factors may play an important role in influencing the occupational type of adult survivors of childhood cancer and we will examine these in additional analyses in comparison to siblings and within survivors. Finally, this study recognizes the complex array of factors that may affect employment status and occupational type outside of demographic, cancer and treatment-related variables. Psychosocial, physical functioning and neurocognitive measures will be examined regarding employment status and occupational type in Aim 3 to see if there are differences across survivors by these factors.

Implications: Along with the increased survival for childhood cancer patients has come the more recent acknowledgement that late effects from childhood cancer may continue throughout a survivor's lifetime.[34-36] Delayed consequences of treatment, such as unemployment, are important for childhood cancer survivors because of the potential remaining years of life that may be affected.[37, 38] One framework for potential intervention is the clinical practice guidelines from the Children's Oncology Group that recognizes the need for periodic evaluation of survivors for educational or vocational

delays (http://www.survivorshipguidelines.org). By understanding whether certain subgroups are at higher risk of being unable to be employed due to health or disability, interventions can target these individuals to provide ongoing help to assist with transitioning into the workplace or finding alternative employment that allows them to work with their health limitations. Survivors who are unemployed may also need additional assistance with the job application process or strategies to address how to attend to the effects of their health problems in the workplace. Additionally, the type of employment can affect an individual's access to resources, long-term financial stability and ability to transition into alternative occupational fields if necessary. The results from this study will help health care professionals, researchers and policy-makers develop appropriate strategies to improve the long-term outcomes for childhood cancer survivors.

Figure 1:



4. Specific Aims/Research Hypotheses:

The purpose of these manuscripts is to describe factors related to employment for childhood cancer survivors at Follow-up 2 (FU2) and make comparisons both within survivors and in relation to the sibling comparison group. First, we will examine whether adult survivors of childhood cancer are less often employed due to reasons related to health or disability, and if they are more likely to report being unemployed and looking for work. In addition, we will describe whether childhood cancer survivors are less likely to be employed in both professional type positions and physical labor type positions compared to non-physical labor positions. We will also evaluate the relationship between specific risk factors on these different employment outcomes.

Aim 1: Evaluate whether adult childhood cancer survivors are unable to be employed due to illness or health in FU2. Evaluate whether adult childhood cancer survivors report being unemployed and looking for work.

- *1a: Examine whether adult survivors of childhood cancer compared to siblings more often report being unable to be employed due to illness or disability.*

  Hypothesis 1a: The proportion of adult survivors of childhood cancers reporting being unable to be employed due to illness or disability will be larger than the proportion of siblings. Survivors with chronic conditions at baseline or subsequent medical late term effects will be more likely to report being unable to be employed due to illness or disability than siblings with chronic conditions at baseline. Additionally, survivors with certain cancers, such as central nervous system tumors, will report additional deficits in being able to work when compared to siblings.

- *1b: Examine the demographic, cancer, treatment-related risk factors and medical late effects related to being unable to be employed due to illness or disability within adult survivors of childhood cancers.*

  Hypothesis 1b: Specific demographic, cancer, treatment-related risk factors, and medical late effects will be related to being unable to be employed for adult survivors of childhood cancers. Demographic factors associated with being unable to be employed include female gender and failure to finish high school. Disease-related factors associated with being unable to be employed include younger age at treatment and type of primary cancer (CNS or brain tumor). Treatment-related factors associated with being unable to be employed include radiation therapy – mainly higher dose (35+ Gy) cranial radiation to the frontal lobes and/or cerebellum. Medical late term effects associated with being unable to be employed include chronic disease grades 3 or 4, musculoskeletal impairment, neurologic impairment, sensory impairment and pulmonary impairment.

- *1c: Examine whether adult survivors of childhood cancers are more likely to be unemployed and looking for work than siblings. Examine the demographic, cancer, treatment-related factors and late term effects related to being unemployed and looking for work within adult survivors of childhood cancers.*

  Hypothesis 1c: The proportion of adult survivors of childhood cancers reporting being unemployed and looking for work will be larger than the proportion of siblings. Survivors who are female, did not finish high school, had a younger age at treatment, had cranial radiation, and report certain medical late effects will be more likely to be unemployed and looking for work compared to other survivors.

- *1d: Compare adult survivors of childhood cancers and their siblings to the National Health and Nutrition Examination Survey (NHANES) sample regarding work status. Specifically, the proportions working full or part time, unemployed and looking for work, not employed because of health, and not working by choice will be compared across the three groups.*

  Hypothesis 1d: Adult survivors of childhood cancers will be less likely to work full or part time and will be more likely to be unemployed and looking for work, or not working because of their health than both siblings and an age, gender and race matched sample from the population-based NHANES sample.

Aim 2: Evaluate occupational type of employed adult childhood cancer survivors in FU2.

- *2a: Examine whether adult survivors of childhood cancers report different occupational types than siblings.*

  Hypothesis 2a: The proportion of adult survivors of childhood cancers reporting professional positions and physical labor type jobs will be smaller than the proportion of siblings. Survivors

with chronic conditions at baseline or subsequent medical late term effects will be less likely to be employed in a professional position and physical labor type jobs. Additionally, survivors with certain cancers, such as central nervous system tumors, will less often report having being employed in a professional or physical labor position.

- *2b: Examine the demographic, cancer, treatment-related risk factors and medical late term effects related occupational type within adult survivors of childhood cancers*

  Hypothesis 2b: Specific demographic, disease, treatment-related risk factors and medical late term effects will be related to type of employment for adult survivors of childhood cancers. Demographic factors associated with being less likely to have a professional position include female gender and failure to finish high school. Disease-related factors include younger age at treatment and type of primary cancer. Treatment-related factors associated with being less likely to be employed in a professional position include radiation therapy – mainly higher dose (35+ Gy) cranial radiation to the frontal lobes and/or cerebellum. Medical late term effects associated with being less likely to have a professional occupation or physical labor occupation include chronic disease grades 3 or 4, musculoskeletal impairment, neurologic impairment, sensory impairment and pulmonary impairment.

Aim 3: Evaluate the relationships between the Brief Symptom Inventory (BSI), neurocognitive functioning, and Short Form 36 (SF-36) physical functioning subscale with unemployment due to illness or disability for adult survivors of childhood cancer in FU2. Evaluate the relationships between personal growth and posttraumatic stress symptoms with unemployment due to illness or disability for adult survivors of childhood cancer. Examine these measures in relation to occupational type for adult survivors of childhood cancer at FU2.

- *3a: Evaluate whether the BSI at baseline is predictive of unemployment due to illness or disability at FU2, and for survivors who are employed, whether occupational type differs.*

  Hypothesis 3a: Survivors who have T-scores ≥63 (indicating poor emotional health) on the global status index at baseline will be more likely to be unemployed due to illness or health at FU2 than survivors with good emotional health. Survivors who have T-scores ≥63 (indicating poor emotional health) on the global status index at baseline will be less likely to hold professional positions at FU2 than survivors with scores <63.

- *3b: Examine whether the BSI, neurocognitive functioning, and SF-36 physical functioning subscale at FU2 are related to unemployment due to illness or disability, and occupational type, for childhood cancer survivors.*

  Hypothesis 3b: For the BSI, survivors who have T-scores ≥63 (indicating poor emotional health) on the global status index will more often report being unable to be employed due to illness or disability compared to survivors with good emotional health. Neurocognitive functioning will be evaluated based on questions from section J of FU2. Kevin Krull and Kiri Ness are currently analyzing and formulating the scoring of these questions as appropriate for the CCSS survivor population and we will follow their methodology, probably utilizing 4 factors (Task Efficiency, Emotional Tolerance, Organization and Memory). Survivors with neurocognitive scores indicating limited functioning (to be defined from the Krull/Ness analysis) will more often report being unable to be employed due to illness or disability. Survivors who have T-scores at or below 40 (1 standard deviation [SD] below the US population mean) on the physical function subscale will more often report being unable to be employed due to illness or disability compared to survivors above this score. These measures will also be analyzed in relation to occupational type at FU2; survivors with lower functioning will be less likely to hold professional or physical labor occupations.

- *3c: Examine whether personal growth from childhood cancer and posttraumatic stress symptoms are related to not being employed due to illness or disability, and occupational type for survivors.*
  Hypothesis 3c: Childhood cancer survivors who report less personal growth about their cancer will be more likely to report being unable to be employed due to illness or disability than survivors who report positive personal growth, and be less likely to hold professional occupational positions. Childhood cancer survivors who meet the criteria for posttraumatic stress disorder (PTSD) will be more likely to report being unable to be employed due to illness or disability than survivors who report positive personal growth and will be less likely to hold professional positions as adults.

5. Analysis Framework

The analysis will be completed by Anne Kirchhoff at the University of Washington School of Public Health and Community Medicine, Department of Health Services. Anne is a 3rd year doctoral student and was funded starting in June 2007 for three years on the National Cancer Institute's Biobehavioral Cancer Prevention and Control training grant (5R25CA092408-04), under Donald Patrick, a professor of Health Services. She has proposed these three CCSS papers as a part of her dissertation project and anticipates completing the analyses by mid-2009. Wendy Leisenring and Debra Friedman at the Statistical Coordinating Center are Anne's mentors for this project. Her analysis will have guidance and oversight from Dr. Leisenring and input from Kiri Ness at St. Jude Children's Hospital, as well as assistance from other CCSS investigators. Dr. Friedman will provide medical and survivorship guidance. Additionally, Anne has several mentors in her department who will provide assistance and consultation, including Tom Wickizer who is her dissertation committee chair, and Diane Martin, both professors in the Department of Health Services.

Sample: For the analysis dataset, we request all survivors and siblings ages ≥18 years at time of Follow-up Survey 2 and who completed the FU2 survey. For the analyses, these samples will be used:

- Aim 1: All adult survivors and sibling comparison group (≥18 years) at time of Follow-up Survey 2 completion in 2002. Additionally, for Aim 1, an age, race and gender 1:1 matched sample will be drawn from the National Health and Nutrition Examination Survey (NHANES) to provide a national employment comparison.
- Aim 2: All adult survivors and sibling comparison group (≥18 years) at the time of Follow-up Survey 2 completion in 2002 who report any full or part-time work.
- Aim 3: This aim uses the same CCSS sample from Aims 1 and 2.

Outcomes: Three binary outcomes will be investigated in this proposal. The first two binary outcomes will be generated from the current employment status question in follow-up survey 2. Additionally, we will explore the feasibility of creating a variable to indicate employment over time by combining the baseline and follow-up 1 and 2 employment questions. The third binary outcome will come from the present occupation question in follow-up survey 2.

Outcomes 1 and 2: Current employment status: (Follow-up Survey 2; question 4): The question asks "What is your current employment status?" Possible responses include: Full time (≥30 hours per week); part time (<30 hours per week); caring for home or family and not seeking work; unemployed and looking for work; unable to work due to illness or disability; retired; student; other - specify. For the analysis, the responses will be categorized into two different binary outcomes:

- unable to be employed due to illness or disability [outcome 1]

- unemployed and looking for work [outcome 2]
- currently employed: individuals who report full or part time work
- not employed by choice: individuals who are retired, student or other who do not report looking for work, or who are caring for home and family and not seeking work

Aim 1a and 1b will examine those unable to be employed due to illness or disability compared to the other responses (outcome 1). Aim 1c will examine individuals who report unemployment and looking for work compared to all other response categories (outcome 2). These two outcomes will also be examined in relation to the psychosocial and functioning measures in Aim 3. Since this question allows for more than one response category to be selected, we will examine potential category combinations, such as individuals who indicate working part time and then write in the reason for part time work, such as because of health reasons.

The category of currently employed will be explored to ascertain whether including part time workers is appropriate due to the fact that the reasons for part time work status may differ for survivors and siblings. These part time workers will be investigated to see if any reason is given for their part time status in the fill-in the blank section in FU2 question 4. Also, this issue may be explored through a sensitivity analysis comparing this category with and without part time workers included. Additionally, the employment status questions from Baseline and Follow-up 1 will be examined to ascertain the feasibility of creating a combined variable with the FU2 employment information to quantify employment over time. These questions will be explored: Baseline questions O5, O6 and O7; Follow-up Survey 1 question 3b; this combined variable would be examined in similar models as the current employment status variable.

Finally, as a part of Aim 1, the NHANES occupational and demographic public use datasets will be used to generate an age, gender and race 1:1 matched comparison considering the timeframe of the FU2 survey (NHANES has available data from 1999-2005). Because NHANES over-samples certain populations, drawing a matched sample will be an appropriate comparison to the survivors and siblings in this study. The NHANES occupational questionnaire asks about work experience in regards to the last week; response categories include: working at a job or business; with a job or business but not at work; looking for work; not working at a job or business; refused; don't know. For those who reported not working, a follow-up question with similar categories to the CCSS survey will allow comparison of individuals not employed because of illness or disability, in school or retired, or choosing to take care of the home or family. The NHANES datasets and documentation are available at http://www.cdc.gov/nchs/nhanes.htm.

Outcome 3: Present occupation: (Follow-up Survey 2; question 5a and 5b): What is your main job title? Briefly describe the primary tasks in your job. Responses were filled-in by respondent.

The categories of occupational type have been created considering how the functionality and physical limitations of survivors may impact their ability to hold certain occupational types. Occupations in the FU2 dataset have been categorized according to the 2000 Standard Occupational Classification (SOC) System developed by the US Department of Labor (http://www.bls.gov/soc/). The SOC has 23 major groups and 96 minor groups; the breakdown of the major categories and frequencies in the CCSS dataset for survivors at FU2 is available on page 13. The 23 major categorizes will be clustered into 3 separate aggregate groups according to the criterion of skill level (training and/or experience required to master the job) and whether the job is physical or non-physical in nature. As standard for this grouping criterion, skill level will be based on *The International Standard Classification of Occupations* (http://www.ilo.org/public/english/bureau/stat/isco/index.htm).

Proposed occupational categories include the following 3 groups:

- Professional/managerial (includes executive, administrative, and managerial; professional specialty)
- Non-physical labor (technicians and related support; sales; administrative support, including clerical; protective service; service occupations, except protective and household)
- Physical labor (machine operators, assemblers, and inspectors; private household; transportation and material moving; handlers, equipment cleaners, helpers, and laborers; farming, forestry, and fishing; precision production, craft, and repair)

Both the professional and physical labor categories are anticipated to be important for survivors. Survivors may be less likely to undergo the training or the education necessary for professional positions. Physical labor positions may be harder for survivors to maintain because of the late term health effects associated with childhood cancers. On page 14 there is an initial grouping of the 23 main categories into these 3 occupational types. Because the occupational data have not been grouped before, Anne will work with her mentors and advisors to develop the most appropriate grouping strategy once the data are closely reviewed. The appropriate categories for certain occupational types, such as military service, are not entirely clear due to the varied nature of military work. However, these positions are held by a very small percentage of survivors (e.g., military personnel are <1% of the sample); therefore, the study group investigators will discuss the appropriate groups for these certain occupations.

Independent Variables: Proposed categories for each of these variables are listed in the three tables below; however, each variable will be examined to find the most appropriate categories. Therefore, the categories listed in the tables starting on page 15 may change according to these analyses. Age at interview and educational achievement are closely related; these variables may be combined if necessary. (MR=Medical record; BL=Baseline survey; FU1=Follow-up 1; FU2=Follow-up 2)

Sociodemographic Variables

Variable	Categories	Survey	Question
Age at interview	List age at interview	FU2	…
Gender	Male; female	…	…
Race	White; black; American Indian or Alaska Native; Asian or Pacific Islander; Other, specify	…	…
Hispanic	Yes; no	…	…
Household income	<20,000; 20,000-39,999; 40,000-59,999; 60,000-79,000; 80,000-99,999; over 100,000; don't know; missing	BL; FU2	BL: Q8 FU2: S1
Number of people supported on income	1; 2; 3; 4; 5; 6; 7; 8; 9 or more	FU2	S2
Personal Income	<20,000; 20,000-39,999; 40,000-59,999; 60,000-79,000; 80,000-99,999; over 100,000; don't know; missing	BL; FU2	BL: Q9 FU2: S3
Health insurance	Yes, including insurance type; No; Canadian citizen; for those insured, any insurance exclusions or restrictions	BL; FU2	BL: Q1-3b FU2: M1-1b
Education	Grade school; high school – did not graduate; completed high school/GED; training after high school other than college; some college; college graduate; post graduate; other, specify	BL; FU1; FU2	BL: O1-2 FU1: 1 FU2: 1
Work status – baseline	Have you ever had a job; during the past 12 months did you work at any time at a job or business; how long has it been since you last worked at a job or business	BL	BL: O5-7
Work status at FU1	Was your employment information correct at BL? Did you work at any time at a job or business?	FU1	3-3b

Current marital status	Single; Married; Living with partner as married; Widowed; Divorced; Separated or no longer living as married	FU2	2
Current living arrangement	Spouse/partner; Parent(s); Roommate(s); Sibling(s); Other relative(s); Alone; Other, specify	FU2	3
Children	Yes, including number of children; No	BL, FU1, FU2	BL: M11 FU1: 8-8a FU2: N1-4

Disease and Treatment-related Variables

Variable	Categories	Survey	Question
Age at diagnosis	List their age at diagnosis	MR	…
Specific diagnosis	ICD-9 codes	MR	…
Any cancer recurrence	Yes, if recurred before FU2, and include date of recurrence; no	MR	…
Secondary cancers	Yes, if occurred before FU2, including type (not including basal cell carcinoma) and date of onset; No	MR	…
Years since diagnosis	List the number of years	MR	…
Treatment era	1970-73; 1974-77; 1978-81; 1982-86	MR	…
Chemotherapy	Any; alkylating agent – score; anthracylcine – score; platinum; bleomycin; other; Maximum dose	MR	…
Radiation	Any; brain; chest; abdominal; pelvic; limb (arm, leg, foot, or hand); total body; missing or unknown; Maximum dose	MR	…
Surgery	Amputation; leg lengthening; leg shortening; CNS tumor resection; other	MR	…
Specific combinations	Brain irradiation + platinum; chest irradiation + beomycin; chest irradiation + anthracycline; Maximum dose	MR	…

Psychosocial, Physical Functioning and Medical Late Effects Variables

Variable	Categories	Survey	Question
Chronic conditions severity score	No condition; Grades 1-4; Multiple health conditions	Created from BL data	…
Medical late effects	Endocrine impairments; musculoskeletal impairments; neurologic impairments; sensory impairments; cardiac impairments; pulmonary impairments	BL; FU1	BL: B9-J15 FU1: 9-13
SF-36	Raw scores for all 8 scales: physical functioning, role-physical, bodily pain, general health, vitality, social functioning, role-emotional, mental health	FU2	E1-F14
Personal Growth	List all 21 question responses	FU2	H1-21
Posttraumatic Stress Disorder	List all 17 question responses	FU2	K1-17
Neurocognitive functioning	List all 25 question responses	FU2	J1-25
Brief Symptom Inventory	List all 18 question responses	BL; FU2	BL: J16-37 FU2: G1-20

Statistical Analysis:

The variables for the following analyses are listed above. For each of the analyses, the appropriate variable forms and goodness-of-fit tests will be checked. For the category of currently employed, the appropriateness of including part time workers will be investigated. Also, certain variables, such as age at diagnosis, may be very important to consider in the context of employment status and type and will be investigated for potential subgroups of interest or possible interactions.

We also recognize the potential influence of both gender and marital status on employment outcomes. Since survivors may be less likely to marry and this also differs by gender,[39] careful examination of gender, specific age groups and marital status will be performed as deemed necessary in these models. Separate models will initially be examined by gender, because of the potential differences in employment. The impact of marriage on employment will be examined by stratifying the models by married and unmarried. Finally, at FU2 there is missing occupational type on 2680 survivors. We will carefully compare subjects missing the outcome vs. those who are not to make sure there are no major differences between them. All analyses will be performed in Stata or SAS.

Aim 1: This aim examines two outcomes: unemployed because of illness or disability and unemployed and looking for work.

- **Aim 1a:** To assess whether adult survivors of childhood cancer compared to siblings more often report being unable to be employed due to illness or disability in FU2, we will calculate the proportion employed, not employed by choice, unemployed and looking for work, and unable to be employed due to illness or disability for survivors and siblings by specific demographic, disease and cancer-related factors by chi-square and t-tests. Multivariate logistic regressions will calculate the risk of reporting being unable to be employed due to illness or disability for survivors compared to the sibling cohort using generalized estimating equations to account for the case-sibling pairs.
- **Aim 1b:** To assess the demographic, disease, and treatment-related risk factors for being unable to be employed due to health for adult survivors of childhood cancers, multivariate logistic regression will compare the risk of being unable to be employed due to illness or health by specific demographic and cancer-related factors among survivors.
- **Aim 1c:** Multivariate logistic regression will calculate the risk of reporting unemployed and looking for work for survivors compared to the sibling cohort using generalized estimating equations to account for the case-sibling pairs. To assess the demographic, disease, and treatment-related risk factors for being unemployed and looking for work for adult survivors of childhood cancers, multivariate logistic regression will compare the risk of being unable to be employed due to illness or health by specific demographic and cancer-related factors among survivors.
- **Aim 1d:** Age, gender and education adjusted proportions will be compared of employed, not employed by choice, unemployed and looking for work, and unable to be employed due to illness or disability for survivors, siblings and NHANES age, race and gender matched control group. Multivariate logistic regression models will compare the likelihood of different work status outcomes for survivors, siblings and NHANES using generalized estimating equations or conditional logistic regression to account for the case-sibling pairs, and the matched NHANES sample, respectively.

Aim 2: This aim examines occupational type as the outcome of interest.

- **Aim 2a:** These analyses are limited to survivors and siblings who report working full or part-time in FU2. To assess whether adult survivors of childhood cancer compared to siblings are less likely to hold professional jobs in FU2, we will calculate the proportion employed in professional, non-physical labor, and physical labor jobs for survivors and siblings by specific demographic, disease and cancer-related factors by chi-square and t-tests. Multivariate logistic regressions will calculate the likelihood of reporting a professional job for survivors compared to the sibling cohort using generalized estimating equations to account for the case-sibling pairs.

- **Aim 2b:** These analyses are limited to survivors who report working full or part-time in FU2. To assess the demographic, disease, and treatment-related risk factors for the likelihood of holding a professional job, multivariate logistic regression will compare the risk of professional job by specific demographic and cancer-related factors among survivors.

Aim 3: This aim examines the same outcomes in Aims 1 and 2 in relation to psychosocial and functioning measures.

- **Aim 3a:** Multivariate logistic regression will assess if the BSI measured at baseline is associated with whether a survivor is unable to be employed due to illness or health at FU2, and for survivors who are working, the type of professional employment at FU2.
- **Aim 3b:** To assess the psychosocial and physical functioning risk factors related to work, multivariate logistic regression will compare the risk of being unable to be employed due to illness or health by BSI, neurocognitive function, and SF-36 physical functioning subscale at FU2. Multivariate logistic regression will compare the types of professional employment by BSI, neurocognitive function, and SF-36 physical functioning subscale at FU2. Because the questions used in section J of FU2 related to neurocognitive function and the BRIEF, a new set of scales is in development by CCSS investigators (Krull and Ness) and we will follow their lead in defining appropriate scoring for this factor.
- **Aim 3c:** Multivariate logistic regression will compare the risk of being unable to be employed due to illness or health, and risk of professional employment, by the measures of personal growth from illness and posttraumatic stress. Posttraumatic stress will be examined both as an aggregate score and as presence or absence of the constellation of symptoms meeting criteria for a diagnosis of PTSD.

Summary of occupational distributions available at FU2:

Occupational Type – SOC classifications	Frequency	Percent
Architecture and Engineering	139	2
Arts, Design, Entertainment, Sports, and Media	196	3
Building and Grounds Cleaning and Maintenance	163	2
Business and Financial Operations	324	5
Community and Social Services	144	2
Computer and Mathematical	275	4
Construction and Extraction	220	3
Education, Training, and Library	498	8
Farming, Fishing, and Forestry	25	0
Food Preparation and Serving Related	294	4
Healthcare Practitioners and Technical	408	6
Healthcare Support	145	2
Installation, Maintenance, and Repair	213	3
Legal	96	1
Life, Physical, and Social Science	76	1
Management	800	12
Military	11	1
Office and Administrative Support	851	13
Personal Care and Service	206	3
Production	401	6
Protective Service	129	2
Sales and Related	574	9
Transportation and Material Moving	251	4
Other - this category other types of positions and will be examined more closely	189	3
Total:	6628	100

Occupational groupings for survivors at FU2:

Professional/Managerial	**Frequency**	**Percent**
Architecture and Engineering	139	2
Arts, Design, Entertainment, Sports, and Media	196	3
Business and Financial Operations	324	5
Community and Social Services	144	2
Computer and Mathematical	275	4
Education, Training, and Library	498	8
Healthcare Practitioners and Technical	408	6
Legal	96	1
Life, Physical, and Social Science	76	1
Management	800	12
Total for category:	**2956**	**45**
Non-physical labor	**Frequency**	**Percent**
Food Preparation and Serving Related	294	4
Healthcare Support	145	2
Office and Administrative Support	851	13
Personal Care and Service	206	3
Protective Service	129	2
Sales and Related	574	9
Total for category:	**2199**	**33**
Physical labor	**Frequency**	**Percent**
Building and Grounds Cleaning and Maintenance	163	2
Construction and Extraction	220	3
Farming, Fishing, and Forestry	25	0
Installation, Maintenance, and Repair	213	3
Production	401	6
Transportation and Material Moving	251	4
Total for category:	**1273**	**19**
Other - to be discussed	**Frequency**	**Percent**
Military	11	0
Other - this category includes professional and other types of positions	189	3

Aim 1:

Table 1: Demographic characteristics of survivors and siblings by employment status [Aim 1a/b]

	Survivors N=					Siblings N=				
Percent	**N**	**Currently employed (%)[1]**	**Unable to be employed (%)[2]**	**Not employed by choice(%)[3]**	**Unemployed & seeking work (%)[4]**	**N**	**Currently employed (%)[1]**	**Unable to be employed (%)[2]**	**Not employed by choice(%)[3]**	**Unemployed & seeking work (%)[4]**
Current age (years)										
18-25										
26-29										
30+										
Gender										
Male										
Female										
Race										
White, non-Hispanic										
Non-white										
Education level										
>High school										
≤High school										
Currently married										
Yes										
No										
Unknown										
Current living arrangement										
Spouse/partner										
Parent(s)/siblings(s) or other relative										
Roommate										
Alone										
Other										
Income ($)										
<20,000										
20,000-39,999										
40,000-59,999										
60,000+										
Missing										
Health Insurance										
Yes										
Canadian										
No										
Children										
Yes										
No										

[1]Reported full time or part time work; [2]Reported unable to work due to illness or disability; [3]Unemployed because not seeking paid work, retired, student or other; [4]Unemployed, but actively looking for work

Table 2: Chronic conditions and late term effects of survivors and siblings by employment status [Aim 1a]

	Survivors N=					Siblings N=				
Percent	**N**	**Currently employed (%)[1]**	**Unable to be employed (%)[2]**	**Not employed by choice(%)[3]**	**Unemployed & seeking work (%)[4]**	**N**	**Currently employed (%)[1]**	**Unable to be employed (%)[2]**	**Not employed by choice(%)[3]**	**Unemployed & seeking work (%)[4]**
Chronic Conditions										
No condition										
Grade 1 (mild)										
Grade 2 (moderate)										
Grade 3 (severe)										
Grade 4 (life-threatening or disabling)										
Any condition										
Grades 1-4										
Grade 3-4										
Multiple health conditions										
≥2										
≥3										
Medical Late Term Effects/Health Outcomes										
Endocrine										
Musculoskeletal										
Neurologic										
Sensory										
Cardiac										
Pulmonary										

[1]Reported full time or part time work; [2]Reported unable to work due to illness or disability; [3]Unemployed because not seeking paid work, retired, student or other; [4]Unemployed, but actively looking for work

Table 3: Cancer-related characteristics of survivors by employment status [Aim 1b]

	N	Currently employed (%)[1]	Unable to be employed (%)[2]	Not employed by choice(%)[3]	Unemployed & seeking work (%)[4]
Age at diagnosis					
<4 years					
≥4 years					
Childhood cancer diagnosis					
Leukemia					
CNS tumors					
Hodgkin disease					
Non-Hodgkin disease					
Wilms tumor					
Neuroblastoma					
Soft tissue sarcoma					
Bone cancer					
Recurrence of cancer					
Yes					
No					
Secondary cancers[5]					
Yes					
No					
Years since diagnosis					
10-15					
16-25					
26+					
Treatment Era					
1970-73					
1974-77					
1978-81					
1982-86					
Any chemotherapy					
Any					
Alkylating agent					
Anthracycline					
Bleomycin					
Other chemotherapy					
None					
Any radiation					
Any					
Brain					
Chest					
Abdominal/pelvic					
Unknown					
None					
Surgery					
Amputation					
Limb-sparing					
CNS tumor resection					
None					

[1]Reported full time or part time work; [2]Reported unable to work due to illness or disability; [3]Unemployed because not seeking paid work, retired, student or other; [4]Unemployed, but actively looking for work; [5]Does not include basal cell carcinoma

Table 4a: Univariate risk of being unable to be employed due to illness or disability by demographic characteristics, chronic conditions & late term effects compared to siblings [Aim 1a]

Demographics	N	Unemployed because of illness or disability Survivors[1] (N)	Siblings[1] (N)	Odds ratio (95% CI)	p-value
Current age (years)					
18-25					
26-29					
30+					
Gender					
Male					
Female					
Race					
White, non-Hispanic					
Non-white					
Education level					
>High school					
≤High school					
Currently married					
Yes					
No					
Unknown					
Current living arrangement					
Spouse/partner					
Parent(s)/siblings(s) or other relative					
Roommate					
Alone					
Other					
Income ($)					
<20,000					
20,000-39,999					
40,000-59,999					
60,000+					
Missing					
Health Insurance					
Yes					
Canadian					
No					
Children					
Yes					
No					
Chronic Conditions					
No condition					
Grade 1 (mild)					
Grade 2 (moderate)					
Grade 3 (severe)					
Grade 4 (life-threatening or disabling)					
Medical Late Term Effects/Health Outcomes					
Endocrine					
Musculoskeletal					
Neurologic					
Sensory					
Cardiac					
Pulmonary					

[1]Reported unable to work due to illness or disability

Table 4b: Multivariate risk of being unable to be employed due to illness or disability by demographic characteristics, chronic conditions & late term effects compared to siblings [Aim 1a]

[variables to be determined from univariate analyses in Table 4a]

Table 5: Risk of being unable to be employed due to illness or disability by cancer type compared to siblings [Aim 1a]

	N	Odds ratio (95% CI)	p-value
Cancer types			
Leukemia			
CNS tumors			
Hodgkin disease			
Non-Hodgkin disease			
Wilms tumor			
Neuroblastoma			
Soft tissue sarcoma			
Bone cancer			
All survivors			
Siblings (referent)		1.00	

Table 6: Multivariate risk for being unable to be employed due to illness or disability among survivors by demographic, cancer, and treatment related factors [Aim 1b]

	N	Odds ratio	95% CI	p-value
Current age (years)				
18-25				
26-29				
30+				
Gender				
Male				
Female				
Race				
White, non-Hispanic				
Non-white				
Education level				
>High school				
≤High school				
Currently married				
Yes				
No				
Unknown				
Current living arrangement				
Spouse/partner				
Parent(s)/siblings(s) or other relative				
Roommate				
Alone				
Other				
Income ($)				
<20,000				
20,000-39,999				
40,000-59,999				
60,000+				
Missing				
Health Insurance				
Yes				
Canadian				
No				
Children				
Yes				
No				
Chronic Conditions				
No condition				
Grade 1 (mild)				
Grade 2 (moderate)				
Grade 3 (severe)				
Grade 4 (life-threatening or disabling)				
Late Term Effects/Health Outcomes				
Endocrine				
Musculoskeletal				
Neurologic				
Sensory				
Cardiac				
Pulmonary				

Age at diagnosis
- <4 years
- ≥4 years

Childhood cancer diagnosis
- Leukemia (referent)
- CNS tumors
- Hodgkin disease
- Non-Hodgkin disease
- Wilms tumor
- Neuroblastoma
- Soft tissue sarcoma
- Bone cancer

Recurrence of cancer
- Yes (referent)
- No

Secondary cancers[1]
- Yes (referent)
- No

Years since diagnosis
- 10-15
- 16-25
- 26+

Treatment Era
- 1970-73 (referent)
- 1974-77
- 1978-81
- 1982-86

Any chemotherapy
- Any
  - Alkylating agent
  - Anthracycline
  - Bleomycin
  - Other chemotherapy
- None (referent)

Any radiation
- Any
  - Brain
  - Chest
  - Abdominal/pelvic
  - Unknown
- None (referent)

Surgery
- Amputation
- Limb-sparing
- CNS tumor resection
- None (referent)

[1]Does not include basal cell carcinoma

Table 7a: Univariate risk of being unemployed and seeking work by demographic characteristics, chronic conditions & late term effects compared to siblings [Aim 1c]

		Unemployed and seeking work			
Diagnosis	**N**	**Survivors (N)** [1]	**Siblings (N)** [1]	**Odds ratio (95% CI)**	**p-value**
Current age (years)					
18-25					
26-29					
30+					
Gender					
Male					
Female					
Race					
White, non-Hispanic					
Non-white					
Education level					
>High school					
≤High school					
Currently married					
Yes					
No					
Unknown					
Current living arrangement					
Spouse/partner					
Parent(s)/siblings(s) or other relative					
Roommate					
Alone					
Other					
Income ($)					
<20,000					
20,000-39,999					
40,000-59,999					
60,000+					
Missing					
Health Insurance					
Yes					
Canadian					
No					
Children					
Yes					
No					
Chronic Conditions					
No condition					
Grade 1 (mild)					
Grade 2 (moderate)					
Grade 3 (severe)					
Grade 4 (life-threatening or disabling)					
Medical Late Term Effects/Health Outcomes					
Endocrine					
Musculoskeletal					
Neurologic					
Sensory					
Cardiac					
Pulmonary					

[1]Reported being unemployed and seeking work at FU2

Table 7b: Multivariate risk of being unemployed and seeking work by demographic characteristics, chronic conditions & late term effects compared to siblings [Aim 1c]

[variables to be determined from univariate analyses in Table 7a]

Table 8: Multivariate risk for being unemployed and looking for work among survivors by demographic, cancer, and treatment related factors [Aim 1c]

	N	Odds ratio	95% CI	p-value
Current age (years)				
18-25				
26-29				
30+				
Gender				
Male				
Female				
Race				
White, non-Hispanic				
Non-white				
Education level				
>High school				
≤High school				
Currently married				
Yes				
No				
Unknown				
Current living arrangement				
Spouse/partner				
Parent(s)/siblings(s) or other relative				
Roommate				
Alone				
Other				
Income ($)				
<20,000				
20,000-39,999				
40,000-59,999				
60,000+				
Missing				
Health Insurance				
Yes				
Canadian				
No				
Children				
Yes				
No				
Chronic Conditions				
No condition				
Grade 1 (mild)				
Grade 2 (moderate)				
Grade 3 (severe)				
Grade 4 (life-threatening or disabling)				

Late Term Effects/Health Outcomes
Endocrine
Musculoskeletal
Neurologic
Sensory
Cardiac
Pulmonary
Age at diagnosis
<4 years
≥4 years
Childhood cancer diagnosis
Leukemia (referent)
CNS tumors
Hodgkin disease
Non-Hodgkin disease
Wilms tumor
Neuroblastoma
Soft tissue sarcoma
Bone cancer
Recurrence of cancer
Yes (referent)
No
Secondary cancers[1]
Yes (referent)
No
Years since diagnosis
10-15
16-25
26+
Treatment Era
1970-73 (referent)
1974-77
1978-81
1982-86
Any chemotherapy
Any
Alkylating agent
Anthracycline
Bleomycin
Other chemotherapy
None (referent)
Any radiation
Any
Brain
Chest
Abdominal/pelvic
Unknown
None (referent)
Surgery
Amputation
Limb-sparing
CNS tumor resection
None (referent)

Table 9: Demographic characteristics of CCSS survivors and siblings with age, race and gender matched NHANES sample [Aim 1d]

N(%)	Survivors N=	Siblings N=	NHANES N=	p-value
Current age				
18-25				
26-29				
30+				
Gender				
Male				
Female				
Race				
White, non-Hispanic				
Non-white				
Education level				
>High school				
≤High school				

Table 10: Multivariate comparison of work status for CCSS survivors and siblings compared to NHANES sample [Aim 1d][1]

	Currently working full or part time[2]			Unable to be employed[3]			Not employed by choice[4]			Unemployed and looking for work[5]		
	N(%)	OR (95% CI)	p-value	N(%)	OR (95% CI)	p-value	N(%)	OR (95% CI)	p-value	N(%)	OR (95% CI)	p-value
Survivors		1.00			1.00			1.00			1.00	
Siblings												
NHANES												

[1]Models adjusted for age, gender, race and educational level
[2]Reported full time or part time work; [3]Reported unable to be employed due to illness or disability; [4]Unemployed because not seeking paid work, retired, student or other; [5]Unemployed, but actively looking for work

Aim 2:

Table 11: Demographic characteristics by occupational type for childhood cancer survivors and siblings [Aim 2a/b]

	Survivors N=				Siblings N=			
	N	Professional/ Managerial (%)	Physical (%)	Non-Physical (%)	N	Professional/ Managerial (%)	Physical (%)	Non-Physical (%)
Demographic characteristics								
Current age (years)								
18-25								
26-29								
30+								
Gender								
Male								
Female								
Race								
White, non-Hispanic								
Non-white								
Education level								
>High school								
≤High school								
Currently married								
Yes								
No								
Unknown								
Current living arrangement								
Spouse/partner								
Parent(s)/siblings(s) or other relative								
Roommate								
Alone								
Other								
Income ($)								
<20,000								
20,000-39,999								
40,000-59,999								
60,000+								
Missing								
Health Insurance								
Yes								
Canadian								
No								
Children								
Yes								
No								

Table 12: Chronic conditions and late term effects of survivors and siblings by occupational type [Aim 2a]

	Survivors N=				Siblings N=			
Percent	**N**	**Professional/ Managerial (%)**	**Physical (%)**	**Non-Physical (%)**	**N**	**Professional/ Managerial (%)**	**Physical (%)**	**Non-Physical (%)**
Chronic Conditions								
No condition								
Grade 1 (mild)								
Grade 2 (moderate)								
Grade 3 (severe)								
Grade 4 (life-threatening or disabling)								
Any condition								
Grades 1-4								
Grade 3-4								
Multiple health conditions								
≥2								
≥3								
Late Term Effects/Health Outcomes								
Endocrine								
Musculoskeletal								
Neurologic								
Sensory								
Cardiac								
Pulmonary								

Table 13: Cancer-related characteristics by occupational type for childhood cancer survivors [Aim 2b]

	N	Professional/ Managerial (%)	Physical (%)	Non-Physical (%)
Age at diagnosis				
<4 years				
≥4 years				
Childhood cancer diagnosis				
Leukemia				
CNS tumors				
Hodgkin disease				
Non-Hodgkin disease				
Wilms tumor				
Neuroblastoma				
Soft tissue sarcoma				
Bone cancer				
Recurrence of cancer				
Yes				
No				
Secondary cancers[1]				
Yes				
No				
Years since diagnosis				
10-15				
15-19				
20+				
Treatment Era				
1970-73				
1974-77				
1978-81				
1982-86				
Any chemotherapy				
Any				
Alkylating agent				
Anthracycline				
Bleomycin				
Other chemotherapy				
None				
Any radiation				
Any				
Brain				
Chest				
Abdominal/pelvic				
Unknown				
None				
Surgery				
Amputation				
Limb-sparing				
CNS tumor resection				
None				

[1]Does not include basal cell carcinoma

Table 14a: Univariate risk of professional position by demographic characteristics, chronic conditions & late term effects compared to siblings [Aim 2a]

		Professional Occupational type			
Demographics	**N**	**Survivors (N)**	**Siblings (N)**	**Odds ratio (95% CI)**	**p-value**
Current age (years)					
18-25					
26-29					
30+					
Gender					
Male					
Female					
Race					
White, non-Hispanic					
Non-white					
Education level					
>High school					
≤High school					
Currently married					
Yes					
No					
Unknown					
Current living arrangement					
Spouse/partner					
Parent(s)/siblings(s) or other relative					
Roommate					
Alone					
Other					
Income ($)					
<20,000					
20,000-39,999					
40,000-59,999					
60,000+					
Missing					
Health Insurance					
Yes					
Canadian					
No					
Children					
Yes					
No					
Chronic Conditions					
No condition					
Grade 1 (mild)					
Grade 2 (moderate)					
Grade 3 (severe)					
Grade 4 (life-threatening or disabling)					
Medical Late Term Effects					
Endocrine					
Musculoskeletal					
Neurologic					
Sensory					
Cardiac					
Pulmonary					

Table 14b: Multivariate risk professional position by demographic characteristics, chronic conditions & late term effects compared to siblings [Aim 2]

[variables to be determined from univariate analyses in Table 11a]

Table 15: Odds of professional work status among survivors by demographic, cancer, and treatment related factors [Aim 2b]

	N	Odds ratio	95% CI	p-value
Current age (years)				
18-25				
26-29				
30+				
Gender				
Male				
Female				
Race				
White, non-Hispanic				
Non-white				
Education level				
>High school				
≤High school				
Currently married				
Yes				
No				
Unknown				
Current living arrangement				
Spouse/partner				
Parent(s)/siblings(s) or other relative				
Roommate				
Alone				
Other				
Income ($)				
<20,000				
20,000-39,999				
40,000-59,999				
60,000+				
Missing				
Health Insurance				
Yes/Canadian				
No				
Children				
Yes				
No				
Chronic Conditions				
No condition				
Grade 1 (mild)				
Grade 2 (moderate)				
Grade 3 (severe)				
Grade 4 (life-threatening or disabling)				
Late Term Effects				

Endocrine	
Musculoskeletal	
Neurologic	
Sensory	
Cardiac	
Pulmonary	
Age at diagnosis	
<4 years	1.00
≥4 years	
Childhood cancer diagnosis	
Leukemia (referent)	1.00
CNS tumors	
Hodgkin disease	
Non-Hodgkin disease	
Wilms tumor	
Neuroblastoma	
Soft tissue sarcoma	
Bone cancer	
Recurrence of cancer	
Yes (referent)	1.00
No	
Secondary cancers[1]	
Yes (referent)	
No	
Years since diagnosis	
10-15	1.00
16-25	
26+	
Treatment Era	
1970-73 (referent)	1.00
1974-77	
1978-81	
1982-86	
Any chemotherapy	
Any	
Alkylating agent	
Anthracycline	
Bleomycin	
Other chemotherapy	
None (referent)	1.00
Any radiation	
Any	
Brain	
Chest	
Abdominal/pelvic	
Unknown	
None (referent)	1.00
Surgery	
Amputation	
Limb-sparing	
CNS tumor resection	
None (referent)	1.00

[1]Does not include basal cell carcinoma

Aim 3:

[demographics table will be included as well for this manuscript]

Table 16: Number and percent of survivors scoring more than 1 standard deviation below the population mean on the Brief Symptom Inventory (BSI) and SF-36 physical functioning subscale and meeting criteria for posttraumatic stress disorder (PTSD), and mean scores for personal growth, PTSD and neurocognitive function, by work status and occupational type [Aim 3]

	All survivors by work status N=					Currently employed survivors N=			
Measure	Currently employed [1]	Unable to be employed [2]	Not employed by choice[3]	Unemployed & seeking work[4]	p-value	Professional/ Managerial (%)	Physical (%)	Non-Physical (%)	p-value
Score >1 SD below population mean	N (%)	N (%)	N (%)	N (%)		N (%)	N (%)	N (%)	
BSI - Baseline									
BSI - FU2									
SF-36 - physical functioning subscale – FU2									
PTSD (meeting diagnostic criteria) – FU2									
Mean score and standard deviation:	mean (sd)	mean (sd)	mean (sd)	mean (sd)		mean (sd)	mean (sd)	mean (sd)	
Personal Growth from Illness – FU2									
PTSD – FU2									
Neurocognitive Functioning – FU2									

[1]Reported full time or part time work; [2]Reported unable to be employed due to illness or disability; [3]Unemployed because not seeking paid work, unemployed and looking for work, retired, student or other; [4]Unemployed, but actively looking for work

Table 17: Multivariate risk of being unemployed due to illness or disability for survivors by psychosocial and functioning measures [Aim 3]

Measure	N	Odds ratio	95% CI	p-value
Brief Symptom Inventory -Baseline T-score				
>=63		1.00		
<63				
Brief Symptom Inventory - FU2				
>=63		1.00		
<63				
Short Form 36 - physical functioning subscale				
≥40		1.00		
<40				
Neurocognitive Function				
Categories to be determined		1.00		
Personal Growth from Illness – scoring to be determined		1.00		
PTSD				
Yes				
No		1.00		

Adjusted for:

Table 18: Multivariate odds of having professional employment for survivors by psychosocial and functioning measures [Aim 3]

Measure	N	Odds ratio	95% CI	p-value
Brief Symptom Inventory -Baseline T-score				
>=63		1.00		
<63				
Brief Symptom Inventory - FU2				
>=63		1.00		
<63				
Short Form 36 - physical functioning subscale				
≥40		1.00		
<40				
Neurocognitive Function				
Categories to be determined		1.00		
Personal Growth from Illness – scoring to be determined		1.00		
PTSD				
Yes				
No		1.00		

Adjusted for:

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