ORIGINAL ARTICLE

Unemployment Following Childhood Cancer

A Systematic Review and Meta-Analysis

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SUMMARY

Background: Childhood cancer survivors are at risk of physical and mental long-term sequelae that may interfere with their employment situation in adulthood. We updated a systematic review from 2006 and assessed unemployment in adult childhood cancer survivors compared to the general population, and its predictors.

Methods: Systematic literature searches for articles published between February 2006 and August 2016 were performed in CINAHL, EMBASE, PubMed, PsycINFO, and SocINDEX. We extracted unemployment rates in studies with and without population controls (controlled/uncontrolled studies). Unemployment in controlled studies was evaluated using a meta-analytic approach.

Results: We included 56 studies, of which 27 were controlled studies. Approximately one in six survivors was unemployed. The overall meta-analysis of controlled studies showed that survivors were more likely to be unemployed than controls (Odds Ratio [OR] = 1.48, 95% confidence interval [CI]: [1.14; 1.93]). Elevated odds were found in survivors in the US and Canada (OR = 1.86, 95% CI: [1.26; 2.75]), as well as in Europe (OR = 1.39, 95% CI: [0.97; 1.97]). Survivors of brain tumors in particular were more likely to be unemployed (OR = 4.62, 95% CI: [2.56; 8.31]). Narrative synthesis across all included studies revealed younger age at study and diagnosis, female sex, radiotherapy, and physical late effects as further predictors of unemployment.

Conclusion: Childhood cancer survivors are at considerable risk of unemployment in adulthood. They may benefit from psycho-social care services along the cancer trajectory to support labor market integration.

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Survival after childhood cancer has substantially improved in the last decades resulting in a growing population of survivors reaching adulthood (1). However, childhood cancer survivors are at high risk of adverse chronic health conditions (2–7). Approximately two thirds of long-term survivors reported at least one chronic health condition and nearly 30% were suffering from severe or life-threatening conditions (2). Although many survivors cope well with such conditions, a considerable number of survivors experienced impaired psycho-social functioning in adult life, particularly in terms of employment (8).

A review published in 2006 showed that adult survivors of childhood cancer were nearly twice as likely to be unemployed than controls (9). Since 2006, the body of literature on unemployment after childhood cancer has steadily grown. Recent studies showed that survivors more often applied for governmental social security benefits than cancer-free individuals (10–12), indicating a relatively high economic burden of childhood cancer on an individual and societal level.

As unemployment is a time-dependent phenomenon, a more up-to-date understanding of unemployment after childhood cancer and a careful identification of predictors is necessary in order to advocate interventions to decrease the individual and societal burden. We therefore updated a systematic review and meta-analysis by de Boer and colleagues (9). Specifically, we aimed to 1) assess the prevalence of unemployment in adult childhood cancer survivors compared to the general population, and 2) identify predictors of unemployment in studies published after January 2006.

Methods

This review complies with the PRISMA statement regarding the reporting of systematic reviews and meta-analyses (13).

Search strategy

The literature search included articles published in peer-reviewed journals between February 2006 and August 2016. We searched the following electronic databases without language restrictions: CINAHL, EMBASE, PubMed, PsycINFO, and SocINDEX. We used search terms (*eFigure 1*) similar to the previous review (9). Reference lists of included studies were hand-searched to identify further articles.

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THE CLINICAL PERSPECTIVE

After successful treatment, long-term survivors of childhood cancer are at increased risk of physical and mental long-term sequelae that may interfere with their employment situation in adulthood. This systematic literature review revealed that a considerable number of long-term survivors of childhood cancer experienced unemployment in adult life. Compared to population controls, childhood cancer survivors were 1.5 times more likely to be unemployed. This was particularly pronounced among survivors of central nervous system tumors, who were nearly 5 times more likely to be unemployed than controls. Health care professionals, policy makers as well as employers play a crucial role in supporting successful labor market integration of childhood cancer survivors. Well-organized long-term follow-up including psycho-social care was recently recommended as a standard of care in pediatric oncology. Follow-up care providers should carefully monitor survivors' educational and, later on, vocational progress and offer guidance for survivors who encounter employment-related problems. This is particularly recommended for survivors of central nervous system tumors, and those who had more intensive treatment and experience more severe physical and mental long-term effects.

Study selection

We used the following inclusion criteria to select eligible studies:

- Quantitative methodology
- Sample size >20
- Age at diagnosis <18 years
- Completed treatment or were diagnosed ≥ 5 years prior to the study
- Age at study ≥ 18 years.

Review articles, editorials, commentaries, and conference abstracts were excluded. Two reviewers (LM, KR) independently assessed the eligibility of studies by first screening titles/abstracts and second, full-texts of the remaining studies. Discrepancies between the reviewers were resolved by discussion.

Data extraction

Data were extracted into a Microsoft Access database including the following:

- First author
- Publication year
- Study origin
- Study design
- Sample size
- Response rate
- Whether or not the study included a control population (controlled or uncontrolled study)
- Type of control population

- Demographic (age, sex) and cancer-related characteristics (diagnosis, age at diagnosis, time since diagnosis)
- Employment data and their stratification (i.e. by diagnosis)
- Predictors of unemployment.

The extracted data were independently double-checked by a second reviewer (KR).

Quality assessment

Study quality was independently assessed by two reviewers (LM, KR) using five criteria displayed in *eTable 1*. These criteria were based on those in the previous review (9).

Statistical analysis

Analyses were performed using Stata version 14.1 (StataCorp LP, College Station, TX). We excluded students and homemakers whenever possible to include only participants eligible for employment. Employment was dichotomized into employed (full-time, part-time, sheltered employment, or parental/sick leave) and unemployed. Six studies did not report the number of controls with the respective employment status because national averages or the number of expected cases were reported (e1–e6). For these studies, we imputed the number of controls using a 1:1 ratio to the respective survivor population.

We performed a meta-analysis including all controlled studies. Employment outcomes were summarized using odds ratios (ORs) with the corresponding 95% confidence interval (95% CI). We used random effect meta-analysis to calculate pooled estimates because we expected substantial between-study variability for two reasons: we included observational studies that are prone to higher variability, and there are large differences across countries in labor markets, social welfare, and health care systems. In a random effect meta-analysis effect estimates of individual studies are assumed to vary around an overall average effect, whereas a fixed effect meta-analysis assumes the same effect across studies (14).

Statistical heterogeneity was identified using I^2 statistics (15). Publication bias was examined using visual checking for asymmetry in funnel plots and Harbord's modified test was used to detect small-study effects (16). We performed sensitivity analyses using other imputation ratios (1:5, 1:20, 1:50) for studies not reporting the number of controls. Furthermore, we compared unemployment rates weighted for sample size between uncontrolled and controlled studies to evaluate the representativeness of the controlled studies.

We then performed similar analyses stratified by:

- Region (Europe, US/Canada, and Asia)
- Diagnostic group
 - blood cancers (leukemia, lymphoma)
 - central nervous system (CNS) tumors
 - bone tumors/soft tissue sarcomas)
- Study quality.

Other predictors of unemployment were investigated using meta-regression to assess associations of the factors age at study, age at diagnosis, and time since diagnosis with the respective OR in controlled studies. Additionally, we narratively synthesized further predictors reported in all included studies.

Results

Literature search and study selection

We identified 1416 articles in the literature search including 102 eligible articles (*Figure 1*). For multiple articles based on the same study, we included only the most recent publication with the largest sample and/or most complete employment data. Therefore, we excluded 46 articles resulting in 56 studies finally included in the systematic review (e1–e56), of which 27 were controlled studies (*eTable 2*).

Study characteristics

Twenty-four studies were performed in Europe, 23 studies in the US or Canada, and 9 studies in Asia (*eTable 2*). Eighteen studies provided stratified employment data for blood cancer, 15 for CNS tumor, and 7 for bone tumor/soft tissue sarcoma survivors. Across all included studies, average age at diagnosis ranged from 2–16 years, mean age at study ranged from 18–38 years, and the percentage of male survivors ranged from 19% to 69%.

Unemployment

The overall meta-analysis of controlled studies showed that survivors were 1.5 times more likely to be unemployed than controls (*Figure 2*; OR: 1.48, 95% confidence interval: [1.14; 1.93]). We observed large differences in unemployment rates among survivors between and within regions (*eTable 2*). Unemployment weighted for sample size was similar in controlled (17%) and uncontrolled (15%) studies. The funnel plot was symmetrical with no indication of small-study effects ($p = 0.326$). Findings remained stable in sensitivity analyses with different imputation ratios for studies not reporting the number of controls.

Unemployment by region

The meta-analysis of European studies showed that survivors had increased odds of unemployment compared to controls (*Figure 2*; OR: 1.39 [0.97; 1.97]). Survivors from the US and Canada were nearly twice as likely as controls to be unemployed (OR = 1.86 [1.26; 2.75]). No increased odds were found for survivors from Asia (OR: 0.87 [0.42; 1.81]). We observed comparable unemployment rates in controlled studies from Europe, the US and Canada, and Asia (16%, $n = 17$; 17%, $n = 8$; 24%, $n = 2$). Unemployment rates in uncontrolled studies were lower in Europe (8%, $n = 7$) and higher in the US and Canada (26%, $n = 15$), and Asia (48%, $n = 7$).

Unemployment by diagnostic group

CNS tumor survivors were nearly 5 times more likely to be unemployed compared to controls (*Figure 3*; OR:

FIGURE 1

Flow diagram of studies excluded and included for systematic review and meta-analysis CCS, childhood cancer survivors

4.62 [2.56; 8.31]). Although not statistically significant, elevated odds were also found for blood cancer (OR: 1.35 [0.89; 2.06]) and bone tumor/soft tissue sarcoma survivors (OR: 1.25 [0.80; 1.95]). For all diagnostic groups, unemployment was higher in uncontrolled compared to controlled studies: CNS tumors (46%, $n = 6$ vs. 27%, $n = 9$), blood cancers (27%, $n = 6$ vs. 13%, $n = 12$), and bone tumors/soft tissue sarcomas (20%, $n = 2$ vs. 16%, $n = 5$).

Quality assessment

Nineteen (34%) studies included a representative survivor and 14 (52%) a representative control population (*eTable 1*). Ten (37%) controlled studies adjusted the comparison of employment for age and sex. Among controlled studies, 7 (26%) studies were of low to moderate and 20 (74%) of high quality. We found similar effect estimates for studies of low to moderate (*eFigure 2*; OR: 1.52 [1.16; 2.00]) and high quality (OR: 1.53 [1.10; 2.12]).

Predictors of unemployment

Meta-regression showed no association between unemployment and survivors' age at study ($p = 0.624$), age at diagnosis ($p = 0.566$), and time since diagnosis ($p = 0.422$) in controlled studies. Across all included studies, four identified younger age at study (e1, e5, e37, e47) and three younger age at diagnosis (e16, e22, e47) as predictors of unemployment. Other socio-demographic predictors were female sex (e2, e5, e16, e37, e47), school dropout (e51), and lower parental education (e16). Clinical predictors of unemployment were (cranial) radiation (e2, e9, e22, e31, e37, e47, e50), stem cell transplantation (e50), and cancer-related late effects (e1, e4, e29, e31, e37, e50, e51) including neurocognitive impairment (e29, e31, e37) or hearing loss (e29).

Discussion

This study updated a previous systematic review on unemployment after childhood cancer (9) to address the growing body of literature on this topic showing inconsistent findings. We found that a considerable number of survivors experienced employment-related problems in adulthood. Approximately one in six survivors was unemployed. Compared to population controls, survivors were 1.5 times more likely to be unemployed. In Germany, a study based on the German Childhood Cancer Registry revealed an unemployment rate of 21% among survivors compared to 16% in controls (e13). However, we observed substantial differences across regions and diagnostic groups. In particular, survivors from the US and Canada and survivors of CNS tumors had increased odds of unemployment.

Our meta-analysis showed that survivors' odds of unemployment was lower compared to a previous review of studies published between 1966 and 2006 (9). Although it is difficult to conclusively determine the reasons for these differences given the broader economic circumstances (e.g. recession in 2008),

stratification by region revealed that this decrease was mainly driven by lower unemployment rates in survivors from the US and Canada in more recent studies. In 2006, de Boer and colleagues hypothesized that cancer-related work discrimination may be relatively high in the US with employers being more reluctant to hire cancer survivors due to fears of lower productivity (9); this may have changed in recent years.

Nevertheless, survivors' odds of unemployment remained higher in the US and Canada compared to Europe. This is of particular concern as in contrast to most other developed countries, health insurance in the US is mainly provided and financially covered by employers (17). Employers in Europe may provide more flexible working conditions with better sick leave compensations (10) that help survivors to stay in the work force despite relatively frequent hospitalizations due to cancer-related late effects (18). Country-specific social welfare systems are important in supporting successful labor market integration. For example, recipients of unemployment benefits often have access to vocational counseling or re-training, and have to meet specific requirements including a minimum number of job applications per month. Typically, social welfare systems are well-established in Scandinavia (10, 12). Besides the many positive aspects of social welfare systems, they may provide wrong incentives by making unemployment financially attractive and thereby obscure negative implications of unemployment (12).

Similar to de Boer and colleagues (9), we found that unemployment is particularly prevalent among CNS tumor survivors. Previous reviews showed that neurocognitive impairments related to intelligence, memory, and executive functioning are common in CNS tumor survivors (19–21), encompassing essential attributes for staying in the workforce. Those survivors may benefit from specific on-the-job training or opportunities for sheltered employment. Several studies also identified female sex as a risk factor of unemployment. Studies in the US found that female survivors encountered higher health-related barriers for employment (22, 23). Another possible explanation might be that female survivors may experience higher work-related discrimination or may have other priorities in life, such as childcare.

Limitations

A limitation of our review is the large heterogeneity in the overall meta-analysis ($I^2 = 95\%$). Stratification by region, diagnostic group, and study quality did not substantially decrease heterogeneity. The remaining heterogeneity may rather be caused by factors inherent in the respective labor market systems or due to different data collection periods. Employment-related problems may also vary between treatment centers according to the extent of psycho-social care provided (9). Our electronic search may have missed potentially relevant studies as we also included studies in which

FIGURE 2

Unemployment in adult survivors of childhood cancer, stratified by region (Europe, Asia, and United States and Canada)

Odds ratio for being unemployed:

OR>1 indicates that survivors are more likely to be unemployed compared to controls.

OR<1 indicates that survivors are less likely to be unemployed compared to controls.

95% CI, 95% confidence interval; I^2 , measure of heterogeneity

FIGURE 3

Unemployment in adult survivors, stratified by diagnostic group (blood cancer, central nervous system tumor and bone tumor/soft tissue sarcoma)

Odds ratio for being unemployed:

OR>1 indicates that survivors are more likely to be unemployed compared to controls,

OR<1 indicates that survivors are less likely to be unemployed compared to controls.

95% CI, 95% confidence interval; I², measure of heterogeneity

employment was not the primary outcome. This was addressed with an extensive hand search, resulting in the inclusion of studies from various countries covering a broad range of childhood cancer diagnoses. We found no indication of publication bias in terms of small-study effects. Study quality varied considerably. Our quality assessment emphasized the inclusion of a control population resulting in a high number of studies rated as low-quality. Unemployment was higher in uncontrolled than in controlled studies in the US and Canada and Asia, and across all diagnostic groups. Therefore, effects in the respective meta-analyses may be underestimated. However, among controlled studies, we found similar effect estimates for studies of high and low to moderate quality. Finally, the meta-analysis of Asian studies only included two studies and should therefore be interpreted with caution.

Summary

Establishing a satisfactory employment situation is challenging, particularly for those growing up with a chronic illness. Childhood onset of cancer, heart disease, diabetes, or epilepsy were all related to poorer vocational outcomes in adulthood (24). Moreover, among childhood cancer survivors, several studies revealed lower marriage rates (25–28) and educational achievement (29–34) compared to cancer-free individuals. Lower education is of concern regarding survivors' vocational progress, as it may compromise the ability to engage in competitive working environments. Survivors encountering educational difficulties might benefit from special education services to minimize disparities compared to controls (35). The implementation of consistent monitoring of childhood cancer survivors' vocational progress has been suggested as a standard of care in pediatric oncology (8). Currently, the availability of cancer-specific vocational rehabilitation services is limited. Moreover, existing services for the general population are often not systematically offered to survivors, even though previous studies have shown that more than half of survivors who received state assistance in job search, placement, and maintenance achieved successful employment (36, 37). In conclusion, childhood cancer survivors are at risk of unemployment and further effort is needed to systematically implement psycho-social care services along the cancer trajectory to support successful labor market integration.

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Conflict of interest statement

The authors declare that no conflict of interest exists.

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KEY MESSAGES

- A considerable number of childhood cancer survivors experience employment-related problems in adulthood: one in six survivors was found to be unemployed.
- Studies with a control population showed that childhood cancer survivors were 1.5 times more likely to be unemployed than healthy controls.
- Substantial differences in unemployment rates were observed across regions and diagnostic groups.
- Survivors from the United States and Canada, and survivors of brain tumors were at particularly high risk of unemployment
- Childhood cancer survivors may benefit from psycho-social care services during and after treatment to support labor market integration.

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Supplementary material

For eReferences please refer to:
www.aerzteblatt-international.de/ref4717

eFigures, eTables:

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Search terms used in electronic databases

Search terms were categorized into four blocks and individual block searches were combined with AND

eFIGURE 1

eFIGURE 2

Unemployment in adult survivors of childhood cancer stratified by study quality

Odds ratio for being unemployed:

OR>1 indicates that survivors are more likely to be unemployed compared to controls.

OR<1 indicates that survivors are less likely to be unemployed compared to controls.

Quality scores of <3 were considered as low to moderate quality and ≥3 as high quality, respectively.

95% CI, 95% confidence interval; I^2 , measure of heterogeneity

eTABLE 1

Quality assessment of included studies

Quality criteria ^{*1}	Number ^{*2}	Percentage ^{*3}
Criterion 1: Does the study have a control population and does it compare employment status of survivors versus controls?		
Yes	27	48
No	29	52
Selection bias		
Criterion 2: Is the survivor population representative?^{*4}		
Yes	19	34
No	32	57
Unclear	5	9
Criterion 3: Is the control population representative?^{*4}		
Yes	14	52
No	9	33
Unclear	4	15
Not applicable ^{*5}	29	–
Bias in outcome assessment		
Criterion 4: Is the comparison of employment status between survivors and controls adjusted for confounding factors^{*5}		
Yes	10	37
No	17	63
Unclear	–	–
Not applicable ^{*5}	29	–
Criterion 5: Was employment status in survivors and controls assessed in similar time periods?		
Yes	20	74
No	–	–
Unclear	7	26
Not applicable ^{*5}	29	–

^{*1} The study was assigned 1 point if the respective criterium was fulfilled (yes); quality scores of <3 points were considered as low to moderate quality and ≥3 points as high quality

^{*2} Numbers refer to the total number of studies included (n=56)

^{*3} Percentages refer to the proportion of studies that provided information (i.e. after excluding "not applicable")

^{*4} Representative if survivor or control population consisted of >75% of the original cohort or a national sample

^{*5} Not applicable if no control population included

^{*6} Adjusted if important prognostic factors (i.e. age, sex) were adequately taken into account

eTABLE 2

Characteristics of included studies by study origin

First author Year (Reference)	Country	Stratification of employment by diagnostic group ^{a1}	Number of survivors ^{a2}	Age at diagnosis (years) ^{a3,a4}	Age at study (years) ^{a3,a4}	Percent male in survivor group (%)	Unemployment in survivor population (%) ^{a5}	Type of control population ^{a6}
European studies								
Johannsdottir, 2010 (e7)	5 Nordic countries	No	247	8 ^{a3,a4}	23 ^{a3,a4}	45	41	General population
Fidler, 2015 (e8)	UK	No	7924	–	–	51	8	General population ^{a7}
Harila, 2011 (e9)	Finland	Yes blood cancer	40	5 ^{a3}	24 ^{a3}	35	10	Regional general population
Berbis, 2016 (e1)	France	Yes blood cancer	360	8 ^{a3}	22 ^{a3}	51	10	National average
Chaume, 2007 (e10)	France	No	32	8 ^{a3}	23 ^{a3}	63	16	–
Dumas, 2016 (e2)	France	Yes blood cancer; nervous system tumor; bone tumor/ soft tissue sarcoma	1818	6 ^{a3}	36 ^{a3}	51	15	National average
Frangé, 2009 (e11)	France	Yes nervous system tumor	24	9 ^{a4}	25 ^{a4}	58	29	–
Freycon, 2014 (e3)	France	Yes blood cancer	73	6–9 ^{a4,a8}	21–23 ^{a4,a8}	49	37 ^{a9}	Regional average
Vinchon, 2011 (e12)	France	Yes nervous system tumor	130	11 ^{a3}	25 ^{a3}	–	25	–
Seitz, 2010 (e13)	Germany	No	778	16 ^{a3}	30 ^{a3}	49	21	Peers of survivors
Wenninger, 2013 (e14)	Germany	No	160	9 ^{a3}	29 ^{a3}	49	4	–
Servizoglou, 2008 (e15)	Greece	No	103	9 ^{a3}	20 ^{a3}	44	73	High school/ university students
Maule, 2017 (e16)	Italy	No	117	–	–	53	34	Regional general population
Pillon, 2013 (e4)	Italy	Yes blood cancer	126	5 ^{a4}	33 ^{a4}	54	4	Regional average
Tremolada, 2015 (e17)	Italy	No	77	8 ^{a3}	19 ^{a3}	54	25	–
Gunnes, 2016 (e18)	Norway	Yes blood cancer; nervous system tumor; bone tumor/ soft tissue sarcoma	3631	–	–	55	7	General population
Johannesen, 2007 (e19)	Norway	Yes blood cancer; nervous system tumor	424	–	–	–	22	General population
Boman, 2009 (e20)	Sweden	Yes nervous system tumor	591	10 ^{a3}	26 ^{a3}	53	27 ^{a10}	General population

Boman, 2010 (e21)	Sweden	Yes blood cancer; nervous system tumor; bone tumor/ soft tissue sarcoma	1716	–	32 ^{*3}	51	16	General population
Holmqvist, 2010 (e22)	Sweden	Yes blood cancer	101	6 ^{*3}	–	49	33	Regional general population
Sundberg, 2011 (e23)	Sweden	No	132	9 ^{*3}	24 ^{*3}	48	8	Regional general population
Sundberg, 2013 (e24)	Sweden	Yes blood cancer	43	–	–	50	14	–
Wengenroth, 2016 (e25)	Switzerland	No	1506	–	29 ^{*3}	52	22	Siblings of survivors
Yagci-Kupeli, 2013 (e5)	Turkey	Yes blood cancer; nervous system tumor	201	10 ^{*4}	23 ^{*4}	63	37	National average
US and Canadian studies								
Edelstein, 2011 (e26)	Canada	Yes blood cancer	15	7 ^{*3}	23 ^{*3}	33	7	–
Armstrong, 2013 (e27)	United States	Yes blood cancer	263	7 ^{*3}	37 ^{*3}	48	36 ^{*10}	–
Berg, 2013 (e28)	United States	No	32	10 ^{*3}	21 ^{*3}	33	19	–
Brinkman, 2015 (e29)	United States	Yes nervous system tumor	406	9 ^{*3}	29 ^{*3}	56	46 ^{*11}	–
Brinkman, 2015 (e30)	United States	No	69	2 ^{*3}	33 ^{*3}	51	25 ^{*10}	–
Brinkman, 2016 (e31)	United States	Yes nervous system tumor	221	9 ^{*4}	26 ^{*4}	59	48	–
Crom, 2007 (e6)	United States	Yes blood cancer; nervous system tumor	1168	7 ^{*4}	30 ^{*4}	50	23	National average
Crom, 2014 (e32)	United States	Yes nervous system tumor	78	–	22 ^{*3}	54	30	Regional general population
Dowling, 2010 (e33)	United States	No	407	–	–	47	32	General population
Fernandez-Pineda, 2017 (e34)	United States	Yes bone tumor/ soft tissue sarcoma	206	13 ^{*3}	37 ^{*3}	52	29	Peers of survivors
Gerhardt, 2007 (e35)	United States	No	56	11 ^{*3}	19 ^{*3}	69	21	Classmates of survivors
Knull, 2012 (e36)	United States	Yes blood cancer	62	15 ^{*3}	42 ^{*3}	47	16	–
Knull, 2013 (e37)	United States	Yes blood cancer	534	7 ^{*3}	33 ^{*3}	48	24	–
Lee, 2007 (e38)	United States	No	45	11 ^{*3}	27 ^{*3}	38	16	–
Phillips-Salimi, 2012 (e39)	United States	No	534	16 ^{*3}	34 ^{*3}	19	27	General population
Rourke, 2007 (e40)	United States	No	138	9 ^{*3}	25 ^{*3}	46	12	–
Schwartz, 2006 (e41)	United States	No	57	11 ^{*3}	22 ^{*3}	47	33	Peers of survivors

Sharp, 2007 (e42)	United States	No	59	10 ^{*3}	27 ^{*3}	44	3	–
Strauser, 2015 (e43)	United States	No	385	–	38 ^{*4}	42	23	–
Wiener, 2006 (e44)	United States	Yes bone tumor/ soft tissue sarcoma	34	16 ^{*3}	34 ^{*3}	53	35	–
Zebrack, 2011 (e45)	United States	No	604	11 ^{*3}	27 ^{*3}	47	13 ^{*10}	–
de Moor, 2011 (e46)	United States and Canada	No	374	12 ^{*3}	32 ^{*3}	51	20	–
Pang, 2008 (e47)	United States and Canada	Yes blood cancer; nervous system tumor; bone tumor/ soft tissue sarcoma	9736	10 ^{*4}	26 ^{*4}	56	15	Siblings of survivors
Asian studies								
Cheung, 2013 (e48)	China	No	22	7 ^{*3}	18 ^{*3}	52	27	Siblings of survivors
Yuen, 2014 (e49)	China	No	47	9 ^{*3}	23 ^{*3}	44	13	–
Ishida, 2011 (e50)	Japan	No	98	8 ^{*3}	23 ^{*4}	42	24	Siblings of survivors
Ishida, 2014 (e51)	Japan	No	157	8 ^{*3}	24 ^{*3}	52	16	–
Sugiyama, 2009 (e52)	Japan	No	32	14 ^{*4}	–	79	66	–
Yano, 2016 (e53)	Japan	Yes nervous system tumor	26	7 ^{*3}	27 ^{*3}	39	15	–
Yonemoto, 2007 (e54)	Japan	Yes bone tumor/ soft tissue sarcoma	25	14 ^{*3}	34 ^{*3}	41	0	–
Kim, 2013 (e55)	South Korea	No	221	10 ^{*3}	22 ^{*3}	59	82 ^{*9}	–
Chou, 2009 (e56)	Taiwan	Yes blood cancer; nervous system tumor	98	14 ^{*3}	20 ^{*3}	62	53	–

UK, United Kingdom; US, United States

*1 Studies with employment data stratified by diagnostic group and with a control group were used in the respective meta-analyses

*2 Refers to the number of survivors with available data on employment in the respective study after exclusion of students and homemakers if possible

*3 Mean

*4 Median

*5 Unemployment rates were calculated after exclusion of students and homemakers if possible

*6 Studies with a control population and comparison of employment status of survivors versus controls were included in the respective meta-analyses

*7 No comparison of employment with control population

*8 Median age at diagnosis and age at study only provided for subgroups

*9 "Unemployment" overlapping with "in education"

*10 "Employment" overlapping with "in education"

*11 "Unemployment" overlapping with "no school degree"