# Marriage and divorce among young adult cancer survivors

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## Abstract

**Purpose**—We examined marital outcomes among cancer survivors diagnosed during early
adulthood from the 2009 Behavioral Risk Factor Surveillance System dataset.

**Methods**—Eligible participants were ages 20–39 years. Of the 74,433 eligible, *N*=1,198 self-
reported a cancer diagnosis between the ages of 18 and 37, were   2 years past diagnosis, and did
not have non-melanoma skin cancer. The remaining *N*=67,063 were controls. Using generalized
linear models adjusted for age, gender, race, and education, we generated relative risks (RR) and
95 % confidence intervals (95 % CI) to examine survivor status on indicators of ever married,
currently married, and divorced/separated.

**Results**—Survivors were slightly older than controls [33.0 (SD=3.8) vs. 30.0 (SD=4.0);
*p*<0.001]. Average time since diagnosis was 7.4 years. Most common diagnoses were cervical
(females; 45 %) and non-Hodgkin lymphoma (males; 20 %). Survivors were less likely to be

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currently married than controls (58 % vs. 64 %; RR=0.92, 95 % CI 0.85–0.99). Among ever married participants, survivors were at an increased risk of divorce/separation than controls (18 % vs. 10 %; RR=1.77, 95 % CI 1.43–2.19). Divorce/separation risk persisted for female survivors (RR 1.83, 95 % CI 1.49–2.25), survivors ages 20–29 (RR 2.57, 95 % CI 1.53–4.34), and survivors ages 30–39 (RR 1.62, 95 % CI 1.29–2.04).

**Conclusions—**The emotional and financial burdens of cancer may lead to marital stress for younger cancer survivors.

**Implications for cancer survivors—**Young survivors may face a higher risk of divorce; support systems are needed to assist them in the years following diagnosis.

## Keywords

Young adult cancer survivors; Cancer survivorship; Marriage; Divorce

## Introduction

Young adulthood is a time of complex lifestyle change and psychosocial development. Young adults (YA) who have been financially dependent on their parents during adolescence begin to transition to independence while completing their education and beginning their careers. During this time, many young adults in their twenties and thirties develop intimate relationships that lead to marriage. In the USA, approximately 69,000 adolescents and young adults ages 15–39 are diagnosed with cancer each year, and the majority will transition to long-term survivorship [1]. However, despite the unique developmental needs of YA cancer patients and survivors, there are still significant gaps in our knowledge about the impact of cancer on social outcomes of this population.

Marital relationships, in particular, may be strained for younger cancer patients as they face health, emotional, and financial stressors from their cancer. For married couples, a cancer diagnosis can bring increased marital distress [2], uncertainty about their partner's health, problems with sexual functioning and fertility [3–6] as well as added financial stress and instability [7]. While approximately 80 % of YA cancer patients survive at least 5 years after diagnosis, many are at risk for developing side effects and chronic health conditions from the chemotherapy, radiation, and surgery received during treatment [8, 9]. For long-term YA cancer survivors, there may be ongoing marital stress in the years following a diagnosis due to the changing health status for the cancer survivor over time and uncertainty about the survivor's health.

Studies of other cancer populations suggest cancer can affect marital outcomes of patients diagnosed at a young age. Several studies of pediatric and adolescent cancer survivors find they are less likely to marry as adults [6, 7,10, 11]. In the Childhood Cancer Survivor Study, a cohort of long-term survivors diagnosed under the age of 21 years in the USA and Canada, survivors ages 18–54 years were approximately 20 % less likely to be ever married compared to their siblings and the general population [12]. For pediatric and adolescent cancers, there appears to be no increased risk for divorce for these survivors as adults [12, 13].

However, the impact of a young adult cancer on marital outcomes may be unique due to the complex lifestyle and social changes that occur during young adulthood. Marriage can bring significant social and emotional support to young cancer patients as well as provide important resources during treatment and recovery through a spouse's income and health insurance coverage. Yet, younger marriages may be less resilient to the stressors of cancer treatment and recovery and face competing burdens from having young children or lower job security that is more common among YAs. For young cancer survivors, the increased emotional and financial burdens from cancer may impact their marriages in ways not seen in other survivor populations.

We developed the current study to determine how marital status is affected for young cancer survivors diagnosed ages 18–37 using the 2009 Behavioral Risk Factor Surveillance System (BRFSS) dataset. Because we were interested in the impact of cancer on marital outcomes among young adults, we limited our analyses to participants currently ages 20–39. We report on the marital status of YA survivors compared to YA controls from BRFSS, including whether these populations differ with divorces or separation. We also compare the YA survivors' marital status to estimates from the 2009 Census for the same age groups. Then, we explore factors associated with marital status among the YA survivors and YA controls including health status and cancer diagnosis.

## Methods

### Participants

The BRFSS is an annual, nationally representative random-digit telephone survey of non-institutionalized adults ages 18 or older in the USA, the District of Columbia, Puerto Rico, Guam, and Virgin Islands. There were 432,607 adults that participated in the 2009 BRFSS, which was the first year that cancer status was ascertained in the full sample. Participants were asked "Have you ever been told by a doctor, nurse, or other health professional that you had cancer?" The test–retest reliability for this question is adequate at $k$=0.91 [14].

Eligible participants were currently ages 20–39 years. We limited our sample to this age range to capture survivors who were out of adolescence and approaching marriage age or of marriage age, using age 39 as our cutoff to correspond with the NCI's upper age limit for young adults [1]. Of the 74,433 eligible, $N$=5,161 did not know whether they had a cancer history, refused to answer the question, or were missing the cancer question. We then limited our eligible sample of YA cancer survivors to those individuals who reported a cancer diagnosis between the ages of 18 and 37 to focus on survivors who were diagnosed during young adulthood, were two or more years from diagnosis, and did not have non-melanoma skin cancer, which excluded $N$=857 survivors.

We then excluded $N$=1 survivor and $N$=153 controls who did not report their marital status. This left us with $N$=1,198 YA cancer survivors and $N$=67,063 YA controls with no history of cancer for analysis. We also used data from the US Census Bureau's Current Population Survey (CPS) to estimate marital status for the US population in 2009 by age and gender. The CPS provides annual reports on the marital status of people ages 15 and older in the USA. The data are available at http://www.census.gov/main/www/access.html.

## Measures

**Cancer-related measures**—Participants indicating a cancer history were asked the age at diagnosis for their first primary cancer and whether they had multiple cancers. Survivors were asked to report the type of cancer for their most recent diagnosis. For diagnosis type, respondents were provided with a list of cancers only if they needed prompting. Using participants' current age and age at first diagnosis, we calculated the years since first diagnosis.

**Marital status outcomes**—Participants reported whether they were currently married, divorced, widowed, separated, never married, or a member of an unmarried couple. We created three outcomes for our main analyses: currently married, ever married (comprised of currently married, divorced, widowed, and separated), and divorced/separated (among those reporting being ever married). These three outcomes were not mutually exclusive, but were created as such to examine different marital statuses among the survivors and controls. We also examined divorces only as a separate category for some analyses, but used divorced/separated as our main comparison because both divorce and separation are a marker of marital stress.

**Other measures**—We examined differences by gender (male or female) and current age (grouped as 20–29 and 30–39 years). Other variables included race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic/Latino, and other/mixed), highest educational attainment, health insurance, employment status, household income, number of children under 18 living in the household, and current employment status, categorized as in Table 1.

**Health status measures**—We used three measures from the Centers for Disease Control and Prevention's health-related quality of life measure (CDC-HRQOL-4 known as the "Healthy Days Measures") to assess self-rated general health and number of healthy days in the past month. The CDC-HRQOL-4 has been validated in several non-institutionalized US populations and performs well in populations with chronic conditions [15]. We used the HRQOL-4 general health status measure, where respondents indicated their health as excellent, very good, good, fair, or poor (dichotomized as excellent/very good/good and fair/poor). We also used questions about the number of unhealthy physical health days (Now thinking about your physical health, which includes physical illness and injury, for how many days during the past 30 days was your physical health not good?) and mental health days (Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?) in the past month. We dichotomized these variables to indicate those with a high level of limitations (Frequent Physical or Mental Distress=physical or mental health was not good for 15 or more days in the past 30 days) [16].

## Statistical analyses

Descriptive statistics and bivariate analyses were calculated for demographic characteristics of the survivors and controls and to compare cancer-related factors by gender for the survivors. We compared the proportions ever married, currently married, divorced, and

divorced/separated among the survivors, BRFSS controls, and the Census estimates for 2009 by age and gender strata.

Then, using generalized linear models with a log link and Poisson family adjusted for age, gender, race, and education, we generated relative risks (RR) and 95 % confidence intervals (95 % CI) to examine the relationship of survivor status for BRFSS survivors versus controls on indicators of being ever married, currently married, and divorced/separated (among those ever married) among age and gender strata [17]. All models, including the age-stratified models, were adjusted for current age as a continuous variable because the mean age of survivors was somewhat older in each age strata than controls (Mean Ages—strata 20–29 survivors 26.6 years vs. controls 24.6 years; strata 30–39 survivors 34.8 years vs. controls 34.4 years).

We ran exploratory analyses to examine the effect of health status on marital status, examining each of the three Health Days Measures separately and in models with the three measures together. Finally, we assessed differences by cancers thought to be related to fertility and sexual functioning (breast, cervical, endometrial, and ovarian for females, and testicular for males).

Because BRFSS uses a complex sampling design, all results are reported weighted by BRFSS survey design and for non-response. We used the unconditional subpopulation approach available as part of the SVY command in Stata 12 to correctly calculate the standard errors for our sample of interest [18]. Type I error was set at $\alpha=0.05$. The BRFSS survey design, sample characteristics, and questionnaires are available at www.cdc.gov/brfss.

## Results

### Demographics and cancer-related factors

The young adult cancer survivors were slightly older than controls [33.0 (SD=3.8) vs. 30.0 (SD=4.0); $p<0.001$]. In Table 1, more survivors were female (76.2 %) than the controls (49.8 %; $p<0.0001$). Survivors tended to be employed less often (61.0 % vs. 67.4 %; overall $p<0.001$). Household income did not differ significantly; approximately 52 % of survivors and controls had incomes of $49,999 (in 2009, the median US income was $50,221) [19]. Survivors were more likely to have children living in their home than the controls (75.5 % vs. 65.7 %, $p=0.0004$). A total of 24.1 % of survivors reported fair or poor health compared to 9.4 % of controls ($p<0.0001$). More than 15 days of physical or mental distress per month were reported by 19.5 % and 23.4 % of survivors compared to 6.3 % and 11.3 % of controls, respectively ($p<0.0001$ for both).

The average time since diagnosis for the YA survivors was 7.4 years (SD=3.8). In Table 2 cervical cancer was most common for females (45 %) and non-Hodgkin lymphoma for males (20 %). Female survivors tended to have a younger age at diagnosis than males (76.5 % vs. 68.2 % diagnosed ages 18–29) and were more likely to have had more than one cancer diagnosis than males (8.0 % vs. 2.2 %).

### Marital status outcomes of young adult survivors compared to BRFSS controls and census

We first compared unadjusted marital status frequencies. Survivors were more likely to be ever married than both controls and the US population (78 % vs. 61 % and 53 %, respectively; Table 3). In particular, younger survivors (ages 20–29) of both genders were more likely to have been ever married compared to controls and the US population. A total of 70 % of female survivors ages 20–29 had a history of marriage compared to 42 % of controls and 38.3 % of the US population. Male survivors ages 20–29 had been ever married 47.3 % of the time, compared to 30 % of controls and 26.3 % of the US population in the same age group. Being currently married was higher among survivors (62 % compared to 54 % of controls and 44.6 % of the population), although fewer female survivors ages 30–39 were currently married compared to BRFSS controls (63 % vs. 72 %).

We then examined the proportion divorced or separated among those who had ever been married. A total of 14.1 % of survivors were divorced compared to 9.6 % of controls and 10.5 % of the population. The largest differences were apparent for the youngest group of male survivors. Twenty-nine percent of male survivors ages 20–29 were divorced compared to 6.3 % of controls and 7.5 % of the US population. However, male survivors ages 30–39 were less likely to be divorced (2.3 % reported being divorced compared to 6.9 % of controls and 10.8 % of the US population). When expanded to include separations, 21 % of survivors reported being divorced or separated, and this was particularly high for males ages 20–29 (31 % compared to 9.6 % controls and 12.9 % US population, although not statistically significant compared to BRFSS).

### Multivariable regression comparisons of survivors and BRFSS controls

We next examined marital status among YA survivors and YA controls in multivariable regressions that adjusted for current age, gender, race, and educational status (Table 4). We found that young adult survivors of cancer did not differ from controls in regards to ever being married (survivors 78 % vs. controls 75 %; RR 1.02, 95 % CI 0.97–1.09). Survivors, however, were 8 % less likely to be currently married than controls (survivors 58 % vs. controls 64 %; RR 0.92, 95 % CI 0.85–0.99, $p=0.04$). Female survivors were currently married less often than controls (survivors 58 % vs. controls 65 %; RR 0.91, 95 % CI 0.83–0.99, $p=0.03$), and survivors ages 30–39 were also less likely to be married (survivors 67 % vs. controls 74 %; RR 0.91, 95 % CI 0.84–0.99, 0.02).

Survivors reported being 77 % more likely to be divorced or separated among those who had ever been married (survivors 18 % vs. controls 10 %; RR 1.77, 95 % CI 1.43–2.19, p<0.001) than controls. This association remained significant when the outcome was limited to divorces only, although the estimate slightly attenuated (RR 1.64, 95 % CI 1.28–2.12; not shown in table). Divorce or separation risk was elevated among female survivors (21 % survivors vs. 11 % controls; RR 1.83, 95 % CI 1.49–2.25, $p<0.001$) when compared to controls. Both age groups of survivors were also more likely to be divorced or separated (ages 20–29, 19 % survivors vs. 9.4 % controls; RR 2.57, 95 % CI 1.53–4.34, $p<0.001$; and ages 30–39, 18 % survivors vs. 10 % controls; RR 1.62, 95 % CI 1.29–2.04, $p<0.001$).

**Factors associated with marital status outcomes for survivors compared to controls**

We ran multivariable regression models that added health status and physical and mental distress to the models for the total sample. Models were fit with each factor separately and with the three health status factors together. For both ever and current married, the estimates did not change with the addition of health status or distress measures. However, the risk of divorce or separation attenuated by approximately 10–15 % when the factors were fit in individual models, suggesting that health status may mediate some of the relationship of cancer status and divorce or separation. When we included all three factors in the same model, the risk of divorce or separation further decreased for survivors compared to controls (RR 1.41, 95 % CI 1.20–1.59).

We next examined cancers we hypothesized to be related to sexual functioning and fertility in models comparing survivors to controls, and in models limited to survivors only (Table 5). Compared to controls, female survivors with cervical cancer were less likely to be currently married (RR 0.78, 95 % CI 0.67–0.91, $p$=0.002) and more likely divorced or separated (RR2.39, 95 % CI 1.86–3.09, $p$<0.001). The risk of divorce or separation was also elevated among ovarian diagnoses (RR 1.98, 95 % CI 1.10–3.57, $p$=0.02) compared to controls.

When limited to associations among cancer survivors only, cervical cancers continued to be less likely to be married (RR 0.76, 95 % CI 0.63–0.91, $p$=0.003) and more likely divorced (RR 2.04, 95 % CI 1.29–3.26, $p$=0.003) compared to other cancers. Breast cancer and testicular cancer were associated with a 65–75 % decreased risk of divorce or separation when compared to other cancer diagnoses. When we adjusted the survivor-only models for years since first cancer diagnosis, the estimates did not change substantially, although the estimates for testicular cancer did become less significant. Including children living in the home to the models did not affect the regression estimates.

## Discussion

In this population-based study of young adult cancer survivors, we found that YA cancer survivors marry at similar levels as the general population. However, our findings suggest that YA cancer survivors are more likely to divorce or separate from their spouse than young adults without a history of cancer. A total of 21 % of YA survivors were divorced compared to 10.8 % of the YA controls, which translated to a 77 % higher risk of divorce or separation in multivariable estimates adjusted for age, gender, race, and educational status. Female YA survivors were approximately 80 % more likely to be divorced or separated than the female YA controls, while males' risk of divorce or separation was elevated, but not statistically significant from controls.

Compared to other cancer populations, YA cancer survivors may have a higher risk of divorce or separation, although our findings should be confirmed in prospective studies. While adult survivors of childhood and adolescent cancer marry less often, their rate of divorce is not higher [12, 13]. Although few studies have examined divorces following cancer among older adults, in general, most studies find divorces are not more common in cancer survivors compared to unaffected samples [20–22].

For young adults in newer relationships that have weathered fewer large life events, the health status, emotional and financial impacts of cancer may prove overwhelming. In our exploratory analyses, when we included self-reported markers of health status in our regression models, the risk of divorce or separation attenuated, indicating that the physical and mental health problems experienced by many YA survivor are related to marital strain. Although we were unable to investigate specific mental health problems, such as co-morbidities or depression, it is likely that some of the cancer survivors in our sample faced emotional cancer-related sequelae, which infuenced their marital relationships. While in general the levels of distress among couples facing cancer appear to be only moderately elevated from unaffected samples [23], such studies have typically focused on older samples or limited diagnosis types, demonstrating a need for investigating emotional health issues in younger couples.

Additionally, our results suggest that younger female survivors may face a higher divorce or separation risk than male survivors, similar to a recent study suggesting marital dissolution after cancer may be more common when the affected spouse is a woman [24]. In adjusted proportions, only 13 % of male survivors were divorced or separated compared to 21 % of female survivors. A cancer diagnosis, coupled with daily activities that may fall disproportionately on women, such as childcare and housework, may cause a larger disruption in younger families where the female partner is sick compared to couples where the male spouse is sick [2].

While BRFSS lacks information on fertility or sexuality issues, our exploratory analyses considered differences by cancer diagnoses potentially related to such matters. We found that both cervical and ovarian cancer survivors were approximately two times more likely to be divorced or separated compared to controls, similar to other studies finding an increased risk of divorce for cervical cancers [20]. Fertility issues and sexual function problems may be particularly common for these diagnoses due to their cancer treatment [25], and contribute to marital stress for couples trying to conceive, suggesting that future research should examine the intersection of marital stability with fertility and sexual functioning issues in younger survivors.

In the USA, marriage rates have fallen over the past 40 years; however, much of decrease has occurred in lower-educated groups, whereas college-educated continue to marry. Similarly, the highly educated are less likely to divorce than those with lower education [26]. Even when adjusting for education in our regression models, we found that the young adult survivors were more likely to divorce or separate than YA controls. Financial stressors may also play a role in divorce or separation for YA cancer survivors. While current household income did not differ between survivors and controls, we were unable to examine how financial status preceding or during cancer treatment affected marital outcomes for YA cancer survivors. It is likely that many of the young survivors faced economic hardship due to missed work, lost income due to spousal caretaking, or gaps in health insurance coverage [27, 28], which could negatively affect their marriage.

Due to the cross-sectional nature of BRFSS, certain limitations should be considered in the interpretation of the findings. We were unable to investigate the timing of the cancer

diagnosis in relation to the timing of marriage or divorce/separation. Thus, some of the participants may have been married well before their cancer diagnosis, or may still be undergoing active cancer treatment, whereas others may be experiencing long-term late effects from their cancer, all of which can affect whether someone marries or ends their marriage. Furthermore, addressing marital status in light of the educational, employment, and income changes that occur during young adulthood is challenging, and we were unable to consider important factors such as whether participants were still living with their parents or currently in school.

We did not examine unmarried or same sex couples in our analyses, erring on the side of being conservative in our definition of marriage due to a lack of information on how unmarried couples may share resources or their living situation. However, unmarried partnerships are likely an important part of the emotional, social, and financial support for many YA cancer survivors and must be examined in future studies. Furthermore, we had very general measures of physical and mental health limitations, no information on sexual functioning and fertility, and no conclusive information on whether the couples had children, limiting our ability to speculate about the reasons behind the higher divorce or separation rate.

The response rate for 2009 BRFSS was 53 % [29], potentially affecting the generalizability of our findings to the overall young adult cancer survivor population. BRFSS may under-represent hard to reach populations, such as racial or ethnic minority populations and younger adults [30], suggesting our findings may underestimate marital status outcomes among YA survivors. Assessing cancer history via self-report can risk misclassification of cancers and non-cancers, although previous studies of BRFSS have found cancer self-report reasonably reliable [14]. BRFSS does not include cancer treatment or other cancer-related information; thus, we were limited in exploring aspects that may impact marital status such as disease stage at diagnosis and whether survivors were undergoing current cancer-related treatment.

A cancer diagnosis can have wide-ranging impacts on the finances and physical and psychosocial health of young adults [31, 32]. In our population-based study, we found that the marriage behaviors of young adult cancer survivors may be different than the general population. YA survivors may face higher risks of being divorced or separated than other young adults of the same age. Because young adulthood is a period of financial and social change, a cancer diagnosis during this time may cause particular burden on young couples who have fewer economic or psychosocial reserves to manage this life-changing event.

## Acknowledgments

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**Table 1**

Characteristics of BRFSS young adult cancer survivors and controls (ages 20–39)

| | YA survivors N=1,198 | | YA controls N=67,063 | | p value |
|---|---|---|---|---|---|
| | N | Weighted % | N | Weighted % | |
| Gender | | | | | |
| Female | 1,036 | 76.2 | 41,632 | 49.8 | <0.0001 |
| Male | 162 | 23.8 | 25,431 | 50.2 | |
| Age (years) | | | | | |
| 20–29 | 218 | 22.7 | 21,906 | 44.7 | <0.0001 |
| 30–39 | 980 | 77.3 | 45,157 | 55.3 | |
| Race/ethnicity[a] | | | | | |
| Non-Hispanic White | 894 | 72.0 | 46,103 | 60.9 | 0.002 |
| Non-Hispanic Black | 87 | 8.5 | 6,700 | 11.0 | |
| Hispanic/Latino | 101 | 11.4 | 8,448 | 20.0 | |
| Other/mixed | 110 | 8.1 | 5,421 | 8.2 | |
| Highest completed education[b] | | | | | |
| High school education | 382 | 34.9 | 21,462 | 34.4 | 0.26 |
| Some college/vocational | 414 | 32.7 | 19,526 | 29.3 | |
| College | 402 | 32.5 | 26,024 | 36.3 | |
| Insurance status[c] | | | | | |
| Insured | 968 | 79.1 | 54,046 | 76.9 | 0.37 |
| Uninsured | 229 | 20.9 | 12,857 | 23.1 | |
| Employment status[d] | | | | | |
| Employed | 731 | 61.0 | 47,151 | 67.4 | <0.0001 |
| Out of work | 125 | 11.1 | 6,224 | 11.7 | |
| Unable to work | 127 | 8.2 | 2,009 | 2.7 | |
| Not in labor force | 213 | 19.7 | 11,535 | 18.3 | |
| Household income[e] ($) | | | | | |
| <$20,000 | 267 | 21.9 | 9,904 | 18.3 | 0.21 |
| $20,000–$34,999 | 224 | 15.0 | 11,789 | 19.2 | |
| $35,000–$49,999 | 145 | 15.3 | 9,301 | 14.5 | |
| $50,000–$74,999 | 178 | 18.2 | 11,279 | 16.8 | |
| $75,000 | 304 | 29.6 | 18,849 | 31.3 | |
| Number of children living in home[f] | | | | | |
| None | 239 | 24.5 | 19,108 | 34.3 | 0.0004 |
| One or more | 959 | 75.5 | 47,841 | 65.7 | |
| General health status[g] | | | | | |
| Excellent/very good/good | 885 | 75.9 | 60,767 | 90.6 | <0.0001 |
| Fair/poor | 309 | 24.1 | 6,063 | 9.4 | |
| Frequent physical distress[g] | | | | | |

| | YA survivors N=1,198 | | YA controls N=67,063 | | p value |
|---|---|---|---|---|---|
| | N | Weighted % | N | Weighted % | |
| 15 days per month | 936 | 80.6 | 62,215 | 93.7 | <0.0001 |
| >15 days per month | 252 | 19.5 | 4,347 | 6.3 | |
| Frequent mental distress[g] | | | | | |
| 15 days per month | 889 | 76.7 | 58,881 | 88.7 | <0.0001 |
| >15 days per month | 298 | 23.4 | 7,601 | 11.3 | |

[a]Race/ethnicity missing for N=6 survivors; N=391 controls

[b]Education missing for N=51 controls

[c]Insurance status missing for N=1 survivor; N=160 controls

[d]Employment status missing for N=2 survivors; N=144 controls

[e]Median US income in 2009 was $50,221; household income missing for N=80 survivors; N=5,941 controls

[f]Number of children living in home is limited to those under the age of 18. Children missing for N=114 controls

[g]General health status missing for N=4 survivors; N=233 controls; physical distress missing for N=10 survivors; N=501 controls; mental distress missing for N=11 survivors; N=581 controls

**Table 2**

Cancer-related variables for young adult cancer survivors by gender

| | Female YA survivors *N*=1,036 | | Male YA survivors *N*=162 | |
|---|---|---|---|---|
| | *N* | Weighted % | *N* | Weighted % |
| Most recent diagnosis | | | | |
| Cervical | 502 | 45.0 | – | |
| Testicular | – | | 34 | 14.3 |
| Ovarian | 95 | 11.4 | – | |
| Melanoma | 114 | 9.9 | 35 | 14.2 |
| Endometrial | 50 | 4.9 | – | |
| Hodgkin disease | 22 | 3.4 | 11 | 10.3 |
| Thyroid | 57 | 4.8 | 7 | 3.7 |
| Breast | 62 | 5.7 | – | |
| Bone | 7 | 1.2 | 6 | 2.0 |
| Leukemia | 10 | 1.5 | 5 | 2.6 |
| Brain | 8 | 1.0 | 4 | <1.0 |
| Non-Hodgkin disease | 16 | 3.4 | 10 | 20.0 |
| Other[a] | 93 | 9.7 | 50 | 32.2 |
| Number of cancers | | | | |
| 1 | 946 | 92.0 | 156 | 97.8 |
| 2 or more | 90 | 8.0 | 6 | 2.2 |
| Age at first diagnosis | | | | |
| 18–29 | 777 | 76.5 | 102 | 68.2 |
| 30–37 | 259 | 23.5 | 60 | 31.8 |
| Years since first diagnosis | | | | |
| 2–5 | 362 | 37.6 | 69 | 44.1 |
| 6–10 | 350 | 36.0 | 58 | 40.0 |
| 11–15 | 225 | 19.7 | 21 | 11.7 |
| 16 or more | 99 | 6.7 | 14 | 4.4 |

[a]Other cancers include cancers reported by <1 % of both female and male survivors (oral, head/neck, liver, renal, stomach, bladder, pancreatic, colon/rectum, esophageal, and lung) as well as cancers only coded as "Other" by BRFSS

**Table 3**

Unadjusted frequencies reporting marital status outcomes by gender and age for YA cancer survivors compared to YA controls and 2009 Census estimates

| | BRFSS | | US population 2009 Census (%) |
|---|---|---|---|
| | YA cancer (%) | YA controls (%) | |
| **Ever married** | | | |
| Total | 78.0 | 61.0[*] | 53.1[**] |
| Females | | | |
|   Age 20–29 | 70.0 | 42.0[*] | 38.3[**] |
|   Age 30–39 | 82.0 | 82.0 | 78.8[**] |
| Males | | | |
|   Age 20–29 | 47.3 | 30.0[*] | 26.3[**] |
|   Age 30–39 | 83.9 | 78.8 | 71.5[**] |
| **Currently married** | | | |
| Total | 62.0 | 54.0[*] | 44.6[**] |
| Females | | | |
|   Age 20–29 | 53.3 | 37.6[*] | 32.3[**] |
|   Age 30–39 | 63.0 | 72.0[*] | 64.5 |
| Males | | | |
|   Age 20–29 | 32.7 | 26.9 | 22.8 |
|   Age 30–39 | 75.3 | 71.4 | 61.0 |
| **Divorced[‡]** | | | |
| Total | 14.1 | 9.6[*] | 10.5[**] |
| Females | | | |
|   Age 20–29 | 15.5 | 6.0[*] | 8.7[**] |
|   Age 30–39 | 16.5 | 8.6[*] | 12.3[**] |
| Males | | | |
|   Age 20–29 | 29.1 | 6.3[*] | 7.5[**] |
|   Age 30–39 | 2.3 | 6.9[*] | 10.8[**] |
| **Divorced/separated[a]** | | | |
| Total | 21.1 | 10.8[*] | 15.3[**] |
| Females | | | |
|   Age 20–29 | 24.1 | 11.1[*] | 15.1[**] |
|   Age 30–39 | 23.1 | 12.3[*] | 17.1[**] |
| Males | | | |
|   Age 20–29 | 31.0 | 9.6 | 12.9 |
|   Age 30–39 | 10.3 | 9.3 | 14.4 |

[*] $p < 0.05$ for survivors vs. controls,

*\*\**$p<0.05$ for survivors vs. 2009 Census

*a*Limited to those ever married

**Table 4**

Adjusted proportions and multivariable relative risks of ever married, currently married, and divorced/separated by gender and age groups for YA survivors compared to YA controls

| | Adjusted proportions and multivariable regression estimates[a] | | | |
| | YA cancer (%) | YA controls (%) | Relative risks (95 % CI) | *p* value[b] |
| --- | --- | --- | --- | --- |
| Ever married | | | | |
| Total | 78 | 75 | 1.02 (0.97–1.09) | 0.37 |
| Gender | | | | |
|   Female | 79 | 77 | 1.03 (0.97–1.09) | 0.37 |
|   Male | 76 | 70 | 1.08 (0.94–1.25) | 0.26 |
| Current age (years) | | | | |
|   20–29 | 48 | 41 | 1.11 (0.95–1.30) | 0.21 |
|   30–39 | 84 | 84 | 1.00 (0.95–1.06) | 0.97 |
| Currently married | | | | |
| Total | 58 | 64 | **0.92 (0.85–0.99)** | **0.04** |
| Gender | | | | |
|   Female | 58 | 65 | **0.91 (0.83–0.99)** | **0.03** |
|   Male | 62 | 61 | 1.03 (0.87–1.22) | 0.74 |
| Current age (years) | | | | |
|   20–29 | 35 | 36 | 0.92 (0.73–1.17) | 0.51 |
|   30–39 | 67 | 74 | **0.91 (0.84–0.99)** | **0.02** |
| Divorced/separated[c] | | | | |
| Total | 18 | 10 | **1.77 (1.43–2.19)** | **<0.001** |
| Gender | | | | |
|   Female | 21 | 11 | **1.83 (1.49–2.25)** | **<0.001** |
|   Male | 13 | 8.2 | 1.57 (0.69–3.56) | 0.28 |
| Current age (years) | | | | |
|   20–29 | 19 | 9.4 | **2.57 (1.53–4.34)** | **<0.001** |
|   30–39 | 18 | 10 | **1.62 (1.29–2.04)** | **<0.001** |

[a] Analyses adjusted for gender as relevant, and age, race, and highest attained education for all estimates; reference group for all models is non cancer controls for the overall sample and for gender and age categories

[b] *p* values calculated from multivariable generalized linear models.

[c] Analyses limited to ever married participants

Bold values are significant at α = 0.05

**Table 5**

Multivariable relative risks and 95 % confidence intervals of the association of cancers related to fertility or sexual functioning outcomes for YA cancer survivors

| | Ever married | | Currently married | | Divorced/separated | |
|---|---|---|---|---|---|---|
| | RR (95 % CI) | *p* value | RR (95 % CI) | *p* value | RR (95 % CI) | *p* value |
| Model 1: YA survivors compared to YA controls[a] | | | | | | |
| Female | | | | | | |
| YA controls (ref) | 1 | | 1 | | 1 | |
| Other cancers | **1.07 (1.00–1.19)** | **0.05** | 1.03 (0.93–1.13) | 0.59 | 1.38 (0.94–2.01) | 0.1 |
| Breast | 1.10 (0.94–1.29) | 0.22 | 1.18 (0.99–1.42) | 0.07 | 0.43 (0.17–1.09) | 0.08 |
| Cervical | 1.00 (0.90–1.10) | 0.93 | **0.78 (0.67–0.91)** | **0.002** | **2.39 (1.86–3.09)** | **<0.001** |
| Endometrial | 0.98 (0.78–1.23) | 0.89 | 0.93 (0.62–1.38) | 0.71 | 1.10 (0.36–3.32) | 0.87 |
| Ovarian | 0.98 (0.74–1.32) | 0.92 | 0.86 (0.59–1.25) | 0.42 | **1.98 (1.10–3.57)** | **0.02** |
| Male | | | | | | |
| YA controls (ref) | 1 | | 1 | | 1 | |
| Testicular | **1.29 (1.06–1.56)** | **0.01** | **1.31 (1.07–1.60)** | **0.008** | 0.79 (0.24–2.62) | 0.69 |
| Other cancer | 1.05 (0.89–1.24) | 0.58 | 0.98 (0.80–1.20) | 0.82 | 1.68 (0.70–4.02) | 0.24 |
| Model 2: survivor-only model[a] | | | | | | |
| Female survivors | | | | | | |
| Other cancers (ref) | 1 | | 1 | | 1 | |
| Breast | 1.05 (0.92–1.21) | 0.46 | 1.17 (0.99–1.38) | 0.07 | **0.34 (0.13–0.92)** | **0.03** |
| Cervical | 0.94 (0.84–1.06) | 0.32 | **0.76 (0.63–0.91)** | **0.003** | **2.04 (1.29–3.26)** | **0.003** |
| Endometrial | 1.00 (0.75–1.32) | 0.99 | 0.98 (0.65–1.47) | 0.91 | 1.17 (0.45–3.04) | 0.75 |
| Ovarian | 0.86 (0.67–1.10) | 0.23 | 0.75 (0.53–1.07) | 0.11 | 1.66 (0.83–3.33) | 0.15 |
| Male survivors | | | | | | |
| Other cancer (ref) | 1 | | 1 | | 1 | |
| Testicular | 1.21 (0.97–1.50) | 0.09 | **1.29 (1.01–1.67)** | **0.04** | **0.24 (0.06–0.98)** | **0.05** |

[a]Analyses adjusted for current age, race, and highest attained education.

Bold values are significant at α = 0.05