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Risky Sexual Behavior in Adolescent Survivors of Childhood Cancer: A Report from the Childhood Cancer Survivor Study

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Abstract

Objective—To identify correlates of risky sexual behavior among adolescents surviving childhood cancer.

Methods—The Child Health and Illness Profile - Adolescent Edition (CHIP-AE) was completed by 307 survivors of childhood cancer aged 15–20 years (*M* age at diagnosis 1.53 years; range 0–3.76). Univariate analyses were performed using Chi-square and Fischer's exact tests, and multivariable logistic regression models were used to calculate odds ratios (OR) and 95% confidence intervals for risky sexual behaviors.

Results—Diagnosis of central nervous system cancer (OR = .13, 95% CI: .02–.96, $p < .05$), no history of beer/wine consumption (OR = .20, CI: .06–.68, $p = .01$), and fewer negative peer influences (OR = .28, CI: .09–.84, $p = .02$) associated with decreased likelihood of sexual intercourse. Good psychological health (scores -1.5 SD on the CHIP-AE Emotional Discomfort scale) associated with decreased risk of early intercourse (OR = .19, CI: .05–.77, $p = .02$), whereas high parental education (college degree) associated with decreased risk of multiple lifetime sexual partners (OR = .25, CI: .09–.72, $p = .01$). Increased time from diagnosis (OR = .27, CI: .10–.78, $p = .02$) and psychological health (OR = .09, CI: .02–.36, $p < .01$) associated with decreased risk of unprotected sex at last intercourse, whereas high parent education associated with increased risk (OR = 4.27, CI: 1.46–12.52, $p = .01$).

Conclusions—Risky sexual behavior in adolescents surviving childhood cancer is associated with cancer type, time since diagnosis, psychological health, alcohol use, and peer influences. Consideration of these factors may provide direction for future interventions designed to reduce adolescent sexual risk-taking.

Keywords

risky sexual behavior; childhood cancer; survivors; adolescents

Adolescents commonly engage in risky health behaviors (e.g., tobacco, drug and alcohol use, unprotected sex), which are associated with a variety of adverse outcomes including substance abuse and dependence, academic and vocational underachievement, and poor physical and mental health (Nebbit et al., 2010; Park et al., 2010; Staton et al., 1999; Vaughn et al., 2009). As such, it is important to identify factors associated with risky behavior, particularly among adolescent survivors of childhood cancer, a population at high risk for late health-related complications (Bhatia et al., 2003; Hudson et al., 2003; Oeffinger et al., 2006). Engagement in risky behavior exacerbates health risk among survivors, resulting in vulnerabilities to both acute and chronic adverse health outcomes (Emmons, 2008; Emmons et al., 2002; Van Leeuwen et al., 1995). Thus, survivors of childhood cancer should abstain from or limit risky health behavior as a mechanism for remaining healthy.

One behavior receiving increased attention is risky sexual behavior, which is defined as the engagement of sexual behavior that increases one's risk of negative health outcomes including transmission/contraction of infection or disease, or unintended pregnancy (CDC, 2013). Examples of risky sexual behavior include unprotected oral, vaginal, or anal contact/intercourse, early sexual debut, multiple sexual partners, and engagement in sexual encounters with high risk individuals. Genital human papillomavirus (HPV), the most common sexually transmitted infection, has been identified as causing cervical and other HPV-related cancers (Sauvageau et al., 2007; Weinstock et al., 2004). HPV is transmitted skin-to-skin and is spread via genital/genital, oral/genital, or digital/genital contact. Infection rates are highest among sexually active adolescents and rise sharply soon after the median age of sexual debut (16 years; Wulf, 2002). The prevalence of HPV is 30–49% among sexually active males and females 14 to 25 years of age (Dunne et al., 2007; Guiliano et al., 2008), with a lifetime prevalence approaching 80% among those who are sexually active. Survivors of childhood cancer have significantly increased risks of developing subsequent HPV-associated malignancies in adulthood relative to their peers (150% excess risk for males, 40% for females overall), and these risks increase to 1200% for penile and 760% for tonsillar cancers among males and females previously treated with radiation therapy (Ojha et al., 2013). Treatment-related immunocompromise has been suggested as a potential mechanism explaining this increased risk (Barzon, Pizzighella, Corti, Mengoli, & Palu, 2002; Bhatia et al., 2001; Sasadeusz et al., 2001). Despite these potential consequences, adolescent survivors of childhood cancer continue to engage in risky sexual behavior at rates equivalent to their siblings (Klosky et al., 2012).

With these potential risks in mind, the current investigation utilized problem behavior theory (PBT; Jessor, 1993; Jessor, et al., 1995) as the theoretical framework for understanding risky sexual behavior in adolescent survivors. By recognizing the interplay between social (i.e., controls, models, and support), psychological (i.e., beliefs, attitudes, orientation), developmental (i.e., age-related norms and expectations, transition-marking behaviors), and environmental risk/protective factors, the consideration of PBT in the survivorship context

may be particularly useful for understanding risky sexual behavior in this vulnerable group (Scaraella et al., 1998; Vazsonyi et al., 2008). For example, survivors may encounter unique life experiences such as an atypical developmental trajectory secondary to treatment, engagement in risky behavior as a mechanism for rejoining peer groups post treatment, and needing to balance cognitive dissonance and social desirability when engaging in cancer-linked behaviors. All of these factors may associate with risky sexual behavior. Although testing the full PBT model is outside of the scope of this study, previous research has identified PBT-consistent factors such as peer influence, school performance, socioeconomic status, and psychological health as contributing to risky health behavior in survivors (Stolley et al., 2010; Thompson et al., 2009; Krull et al., 2010). These relationships have not yet been examined in relation to sexual risk-taking among adolescent survivors, but it is hypothesized that these described factors also differentiate engagement in risky sexual behavior in this group as well. Finally, cancer-specific factors have also been associated with academic performance, quality of social interactions, and alcohol use (Dolson et al., 2009; Ris & Noll, 2000), factors that have also been linked to risky sexual behavior in adolescents without a history of cancer. Therefore, the influence of factors within and between social, environmental, biological, developmental, and psychological domains may be magnified by the biological vulnerability observed in survivors of childhood cancer and should be considered in this high risk population.

Despite their increased health risks secondary to cancer treatment, no current studies have considered factors contributing to risky sexual behavior among adolescent survivors of childhood cancer. As such, the purpose of this study was to examine the relationship between potential risk/protective factors and sexual risk taking in this compromised group.

Methods

Participants

Participants for this Institutional Review Board-approved study were selected from the adolescent subset of the Childhood Cancer Survivor Study (CCSS) cohort, a cohort of childhood cancer survivors in the US and Canada (Robison et al., 2009). Details of the study and participant characteristics have been reported previously (Robison et al., 2002; Robison et al., 2009), and the prevalence of risky (including sexual) behaviors (and comparisons to sibling controls) have also been reported in the adolescent subset as well (Klosky et al., 2012). Briefly, the overall cohort includes individuals who were treated for leukemia, lymphoma, central nervous system (CNS) malignancy, kidney cancer, neuroblastoma, malignant bone tumor, or soft tissue sarcoma at 26 institutions in the US and Canada. To be eligible for the larger cohort, participants were diagnosed between 1970 and 1986, were less than 21 years of age at diagnosis, and had survived at least 5 years post diagnosis.

At the time of study recruitment, 702 survivors aged 15–19 years met preliminary eligibility for this study based on age. Because only the youngest in the original CCSS cohort were considered for participation in this study, all survivors were between 0 and 3.76 years of age at diagnosis. Furthermore, because some of the oldest adolescents returned the study questionnaire after turning 20 years of age, the age range of the participants will be reported as 15–20 years. With respect to demographic, diagnostic, and treatment characteristics,

survivors who were White, older, female, and from households with an income of \$60,000 were more likely to participate in the study as compared to non-participants (p -values ranged from $< .01$ – $.03$). Data collection was completed in 2005, and reasons for refusing participation or failing to return questionnaires were not collected. See Figure 1 for enrollment details.

Instrumentation

Adolescent risk-taking behaviors and associated factors were assessed using the Child Health and Illness Profile - Adolescent Edition (CHIP-AE; Starfield et al., 1994). The CHIP-AE is a 214-item self-report measure that evaluates teen health status in six global domains: (1) Satisfaction, (2) Discomfort, (3) Resilience, (4) Risks, (5) Achievement, and (6) Disorders, and yields 20 subdomains. Items on the CHIP-AE are scored on a Likert-type scale, typically ranging from 1 to 5. Higher scores indicate healthier, or decreased, risk behavior. CHIP-AE subdomain scores are standardized at 20 with a standard deviation of 5. Those participants whose scores fell at or below -1.5 SD (e.g., scores falling at 12.5 or lower) were classified in “at risk” groups, whereas those with scores falling above -1.5 SD were considered to be in the “decreased risk” groups. The -1.5 SD boundary has traditionally been used when identifying disordered behavior/psychological functioning in adolescents, and utilization of this cutoff allows for comparison with other published research (Gravetter & Wallnau, 2004). Internal reliabilities (Cronbach’s alpha) for the CHIP-AE subdomains have previously been reported as ranging from .72 – .87 (Starfield et al., 1995), and with the exception of Psychosocial Disorders, ranged from .60 – .89 in the present study. See Starfield et al. 1995 and 1996 for detailed information regarding the validity and other psychometric properties of the CHIP-AE.

Primary Outcomes

Measurement of risky sexual behavior was also assessed as part of the CHIP-AE, and outcomes are defined as follows: 1) history of sexual intercourse (yes/no), 2) age in years at first intercourse ($<$ or ≥ 16 years of age), 3) number of sexual partners ($<$ or ≥ 2 partners), and 4) utilization of contraception/pregnancy prevention or sexually transmitted infection (STI) prevention at last sexual intercourse (yes/no). Less than 16 years of age was used to describe “early” onset of sexual intercourse, as the median age for first sexual intercourse in the US is 16 years (Wulf, 2002). For the purposes of this study, the last item was separated into two distinct items addressing (a) pregnancy prevention and (b) STI prevention. Participants endorsing any of the hormonal or barrier contraceptive options (condom/rubber, birth control pill/Norplant/Depo Provera, diaphragm or sponge, or foam/jelly use) were coded as “yes” for pregnancy prevention, whereas only those who reported condom use were coded as “yes” for STI prevention. As a result, 5 risky sexual behaviors were utilized as primary outcomes in this study.

Independent Variables

Sociodemographic and Medical Variables—The following sociodemographic factors were obtained via self-report: gender (male/female), age in years (15–17/18–20), race (White/non-White), educational status (in school/not in school), and parent education ($<$

college graduate/ college graduate). Medical factors that were considered included cancer diagnosis, time since diagnosis, treatment type, and history of CNS-directed treatment. See Table 2.

Psychological Variables—Psychological variables were also collected as part of the CHIP-AE and tested as potentially associating with the sexual risk-taking outcomes. Specific subdomains of the CHIP-AE that were considered included Self-Esteem (self-concept, satisfaction with self), Emotional Discomfort (feelings and symptoms of distress), Family Involvement (support from family members), Social Problem-Solving (individual coping with problems), Home Safety and Health (home-based prevention of harm), Threats to Achievement (negative behaviors that threaten/interrupt normative social development), Peer Influences (adolescent involvement/exposure with peers who engage in risky health behaviors), Academic Performance (assessment of academic achievements and school accomplishments), and Psychosocial Disorder (adolescent cognitive and behavioral problems).

Non-Sexual Risk Behaviors—The CHIP-AE also measures non-sexual risk behaviors including tobacco use (i.e., cigarette, smokeless tobacco), alcohol consumption (i.e., beer/wine, hard liquor/mixed drinks, binge drinking), and illicit drug use (i.e., marijuana, crack/cocaine), which were also considered in study models. These risk behaviors were assessed on a Likert-type scale from 1 to 5. The five response options were then collapsed into three mutually exclusive categories with scores of 1 (past week) and 2 (past month) forming the “current use” category, scores of 3 (past year) and 4 (more than a year ago) forming the “past use” category, and a score of 5 (never) forming the “never used” category.

Analyses

Descriptive statistics were calculated for sociodemographic, medical, behavioral and psychological characteristics. Any scale with Cronbach’s $\alpha < .70$ was excluded from all subsequent analyses. Comparisons utilizing Chi-square statistics or Fisher’s exact test were initially conducted. For each sexual risk behavior outcome, univariate analyses of the independent variables were performed between those with and without a history of the specified risky sexual behavior. The prevalence of risky sexual behavior was then compared in multivariate logistic regression models. After confirming the absence of multicollinearity among predictors (defined as correlation $> .80$), risk factors with p -values less than .15 in the univariate analyses were included in each of the models. The Hosmer and Lemeshow test was used to evaluate goodness of fit for logistic regression models. C-statistics were used as indicators of how well the logistic regression models discriminated between observations at different levels of the outcome ($> .70$ indicates acceptable discrimination). Results are reported as odds ratios (OR) with 95% confidence intervals (CI).

Results

Characteristics of the Study Population

A total of 307 adolescent survivors completed the study questionnaire (M age = 18.1 years, $SD = 1.0$, range: 15.4 – 20.4 years). The majority of participants were female (59.9%),

White (88.6%), and in school (58.0%). Most had parents with a college degree or higher (56.0%). Participants frequently resided in a household with an annual income of less than \$60,000 (51.8%) and had some type of health insurance (81.4%). With respect to cancer-specific demographic information, the majority of participants were diagnosed prior to 2 years of age (64.5%) and were 15–20 years post diagnosis (97.7%). Diagnoses included: 54.8% solid tumors, 32.2% leukemias/lymphomas, and 13.0% CNS tumors. Most participants had received either chemotherapy only (46.9%) or chemotherapy with radiation therapy (32.2%). Over one third (37.1%) received CNS-directed therapy. See Table 1 for additional demographic information.

Univariate Factors Associated with Risky Sexual Behavior

Univariate differences in sexual history, early initiation of sexual activity, history of multiple sexual partners, use of pregnancy prevention, and utilization of STI prevention were assessed as a function of sociodemographic, medical, behavioral, and psychological variables (see Table 2). In brief, older adolescents were more likely to report a history of sexual intercourse ($p < .01$), while younger participants were more likely to report early initiation of sexual intercourse ($p < .01$). Lower parental education was associated with increased participant history of sexual intercourse ($p = .02$), multiple sexual partners ($p = .03$), and increased utilization of STI prevention at last intercourse ($p = .04$). Those with a history of CNS malignancy were less likely to report a history of sexual intercourse ($p < .05$), but sexually experienced survivors who received treatment to the CNS were more likely to report having multiple partners ($p = .03$). Survivors who reported a history and/or current cigarette use, marijuana use, and binge drinking behaviors were more likely to report a history of sexual intercourse ($ps = .01$) and having had multiple partners ($ps = .01$). Increased threats to achievement were associated with increased participant history of sexual intercourse ($p = .02$) and early sexual debut ($p = .02$), whereas increased negative peer influences related to increased history of sexual intercourse and multiple sexual partners ($ps < .01$). Among psychological risk factors, poor self-esteem and emotional discomfort were associated with a lack of pregnancy prevention ($ps = .02$) or STI prevention ($ps < .05$) at last intercourse. There were no univariate differences in history of sexual intercourse, early initiation of sexual activity, history of multiple sexual partners, or utilization of a form of pregnancy or STI prevention as a function of race or household income.

Multivariate Models of Sexual Behavior

History of sexual intercourse (Table 3)—Based on results from the univariate analyses (Table 2), the following variables were included in the multivariate model testing factors associated with engagement in sexual intercourse among adolescent cancer survivors: gender, age, educational status, parent education, time since diagnosis, diagnosis, history of CNS treatment, cigarette use, beer/wine use, history of binge drinking, marijuana use, academic performance, threats to achievement, and peer influences. Using a positive history of sexual intercourse as the outcome, results of the multivariate logistic regression revealed that a CNS diagnosis (OR = .13, 95% CI: .02 – .96, $p = .05$), no history of beer/wine consumption (OR = .20, CI: .06 – .68, $p = .01$), and few negative peer influences (OR = .28, CI: .09 – .84, $p = .02$) associated with a decreased likelihood of having a history of sexual intercourse (Table 3).

Age at sexual debut—The following variables were included in the multivariate model identifying predictors of age at sexual debut (i.e., age at first sexual intercourse): age, time since diagnosis, diagnosis, cigarette use, marijuana use, self-esteem, emotional discomfort, and threats to achievement. Using younger age of initiation of sexual intercourse (i.e., < 16 years of age) as the outcome, good psychological health (i.e., not at risk for significant emotional discomfort) associated with a decreased likelihood of having engaged in early sexual intercourse (OR = .19, CI: .05 – .77, $p = .02$).

Lifetime history of sexual partners—The following variables were included in the multivariate model considering lifetime history of multiple sexual partners (i.e., one partner versus two or more partners): parent education, CNS treatment, cigarette use, history of binge drinking, marijuana use, emotional discomfort, and threats to achievement. Academic performance was also a significant univariate predictor of number of sexual partners; however, it was excluded from the multivariate model due to the (right) skewed distribution of the sample. Survivors whose parents had a college degree or higher were less likely to report having had multiple sexual partners (OR = .25, CI: .09 – .72, $p = .01$).

Pregnancy prevention efforts—The following variables were included in the multivariate model identifying predictors of contraception use at last sexual intercourse: parent education, self-esteem, emotional discomfort, and threats to achievement. None of the factors included in the model were found to independently associate with contraception use.

Sexually transmitted infection prevention efforts (Table 4)—The following variables were included in the multivariate model identifying predictors of condom use at last sexual intercourse: parent education, time since diagnosis, self-esteem, and emotional discomfort. Survivors who were further from diagnosis (OR = .27, CI: .10 – .78, $p = .02$) or who were psychologically healthy (OR = .09, CI: .02 – .36, $p < .01$) were less likely to report unprotected sex at last intercourse. However, having parents with college degrees or higher was associated with a greater likelihood to engage in unprotected sex (OR = 4.27, CI: 1.46 – 12.52, $p = .01$).

Discussion

Adolescent survivors of childhood cancer engage in risky sexual behavior at rates equivalent to sibling controls (Klosky et al., 2012). This is concerning in that adolescents with a cancer history are already at increased likelihood for developing later health complications, including second cancers, and these risks may be exacerbated by engagement in risky behaviors. Given this predisposition, the present study systematically examined factors associated with sexual risk taking among adolescent survivors of childhood cancer. This included consideration of cancer-specific/biological, social, psychological, developmental, and environmental risk/protective factors, which have been previously described in Jessor and colleagues' Problem Behavior Theory (PBT) as contributing to risky behavior among typically developing adolescent populations (Jessor, 1993; Jessor, et al., 1995).

In regard to cancer-specific variables, history of CNS malignancy was related to lower risk of sexual intercourse history, whereas greater time since diagnosis associated with increased

STI prevention behaviors. These findings are consistent with those of Sundberg and colleagues (2011), who found that among adult survivors of childhood cancer, males with a history of CNS tumor reported fewer sexual partners (both within the preceding year and over one's lifetime) relative to healthy controls. Survivors of CNS tumor also experience greater difficulties in cognitive and social functioning. All participants in the current study were diagnosed prior to age 4, and this younger age group is known to be at particularly high risk for cognitive late effects resulting from CNS-directed cancer therapies. While it is optimistic that adolescent survivors experience an increased likelihood for engaging in STI prevention as time from diagnosis increases, it is concerning that similar safer-sex behaviors are less frequently reported closer to the conclusion of treatment. This is disconcerting considering that cancer survivors are most likely to be immunocompromised while on or shortly after completing cancer-directed therapy, placing them at greater risk for health complication should they acquire an STI during this period.

This finding highlights the need for implementing psychoeducational interventions earlier in the cancer trajectory for the promotion safer sexual behaviors, particularly during periods of elevated health vulnerability. For this group, interventions created for typically developing adolescents should be expanded upon to address survivor-specific concerns such as perceived infertility and health vulnerabilities, in addition to consequences of STI acquisition including second cancers. By taking advantage of the increased patient contacts associated with cancer care, health care providers could then not only deliver these interventions to patients but to their partners as well. For the promotion of health in the youngest survivors, oncology centers could also offer parent trainings for the encouragement of parent-child conversations on protective behaviors and sexual risk taking from the survivorship perspective. Our data suggests that having well educated parents does not protect adolescents from engaging in unsafe sex. As such, delivery of safe sex messages by informed health care providers could be particularly beneficial in this group.

Having never consumed beer/wine and having fewer negative peer influences were also associated with a reduced likelihood of ever having engaged in sexual intercourse. These results are consistent with numerous studies that link alcohol use, impaired decision-making, and risky sexual behavior among both typically developing and chronically ill populations (Draus, Santos, Franklin, & Foley, 2008; Sutherland & Shepherd, 2001; Valencia & Cromer, 2000). These findings are also consistent with PBT, which cites alcohol use (behavior domain) and peer influences (perceived influence domain) as promoting adolescent engagement in risky sexual behavior (Jessor, 1993; Jessor et al., 1995). As previously stated, adolescents surviving cancer are often at risk for cognitive late effects, including impulsivity, inattention, poor planning and decision-making, which may in turn promote susceptibility to being influenced by negative peer pressure (Conklin et al., 2010; Moleski, 2000; Mulhern et al., 2004; Palmer et al., 2003; Pietilä et al., 2012; Ris & Noll, 1994; Walter et al., 1999). When these risks are combined with survivors' desires to establish and maintain peer relations/group membership (along with perceptions of invincibility/optimistic bias), engagement in sexual risk-taking may increase. Currently, school reintegration programs for survivors focus primarily on academic needs (Keene, 2003). Based on the results of this study, it appears that social concerns should also be addressed, with an emphasis on coping with negative peer influences and minimizing risky (i.e., sexual)

behaviors. Highlighting the relations between engagement in risky behaviors (e.g., alcohol use, illicit drug use, etc.), impaired decision-making (both as a function of cancer late effects and typical adolescent brain development), and unplanned risky sexual encounters is indicated as well.

Adolescent survivors reporting better psychological health were more likely to have later sexual debut. Consistent with PBT, this suggests that psychological well-being may act as a protective factor buffering against early sexual contacts. Similar results were reported by Donenberg and colleagues (2003), who found that adolescents with impaired social functioning and increased externalizing behavior were more likely to report earlier sexual debut. Specific impairments described in Donenberg's study included perceived problems with parents and negative peer influences. Among adolescents, lower self-esteem (a construct related to psychological health) has been consistently linked with earlier sexual debut and riskier sexual behavior, while emotional distress has been related to greater likelihood of previous STI, greater number of sexual partners, and having riskier sexual partners (Ethier et al., 2006). Collectively, these findings highlight the impetus for developing health promoting interventions that focus on modifying psychological variables, such as improving emotional functioning, as a means of reducing risky sexual behavior in survivors. As such, these adolescents could also benefit from learning about the associations between poor mental health and risky sexual behavior in a group context (e.g., group therapy, virtual and in-person structured support groups, retreats, conferences, etc.). Providing forums for these discussions helps to reduce stigma surrounding mental health difficulties secondary to cancer treatment, while also highlighting the normative developmental challenges that exist for most adolescents, such as navigating peer and romantic relationships, refraining from substance use, and making healthy decisions about sexual behavior.

Although this is the largest study to date to report on correlates of risky sexual behavior among adolescent survivors of childhood cancer, the study design was cross-sectional, utilized a pragmatic (as opposed to theoretical) approach to model building, included only those diagnosed between 0 and 4 years of age, included an overrepresentation of female and White participants, and relied on self-report which introduces potential bias and limits generalizability. Rates of participation were also presumably suboptimal due to the method of participant enrollment. However, when assessing risky sexual behavior and associated factors, our outlined mailed questionnaire approach may possess significant advantages over more traditional methods. Previous studies have questioned the validity of adolescent survey responses when eliciting sensitive information in the medical setting (Horm et al. 1996; Griesler et al., 2008). While in clinic, adolescent survivors may feel inadvertently pressured to under-report risky health behavior in the presence of parents and/or the medical team (Kann et al., 2002; Patrick et al., 1994; Velicer et al., 1992). Questionnaire completion in the private home setting (as was the case in this study) may reduce this risk by allowing increased anonymity and confidentiality, which, in turn, may promote the disclosure of more valid reporting. Future research may benefit from expanding data collection to a young adult population and/or inclusion of participants diagnosed with cancer in adolescence, as these groups may be qualitatively different (but with increased health risk) with respect to sexual risk-taking behavior.

With the discovery that HPV causes cervical and other cancers, risky sexual behavior has recently been highlighted as an important health behavior that has distinct implications for childhood cancer survivors. As survivors are at risk for altered immunity (particularly those treated with hematopoietic stem cell transplantation or pelvic irradiation, or those diagnosed with Hodgkin lymphoma), they may be at relatively higher risk for HPV-related complication secondary to infection (Klosky et al., 2009). Fortunately, two HPV vaccinations have recently been FDA-approved in the US, and the *Children's Oncology Group's Long-Term Follow-Up Guidelines for Survivors of Childhood, Adolescent and Young Adult Cancer Version 3.0* has recommended HPV vaccination for all eligible females surviving childhood cancer (American Academy of Pediatrics Section on Hematology/Oncology, Children's Oncology Group, 2009). Although it is encouraging that 72–84% of sexually active survivors reported use of a method to prevent pregnancy or STI at last intercourse, HPV is transmitted via skin-to-skin contact, suggesting that all sexually active survivors are at-risk for infection regardless of whether or not standard methods of pregnancy protection and/or STI are utilized.

Although not directly assessed in this study, infertility among survivors (and perceptions thereof) and its relation to risky sexual behavior should also be considered for future research. This is important as survivors who perceive themselves as being infertile may engage in riskier sexual behaviors (Zebrack et al., 2004) and are more likely to report having experienced a high-risk HIV transmission situation (Phillips-Salimi et al., 2012). As demonstrated by the gender trend in the sexual intercourse model, this may be particularly applicable to female survivors who often erroneously attribute treatment-related interruptions in menses with infertility (Murphy, Klosky, Termuhlen, Sawczyn, & Quinn, 2013). Alternately, survivors with suspected infertility have reported engaging in condom use to appear fertile and avoid having to disclose their infertility status (Crawshaw & Sloper, 2010). Adding to the difficulties of adapting to potential infertility, survivors are frequently unsure about their fertility status (Oosterhuis et al., 2008; Schover et al., 2002), and this lack of clarity may also contribute to the relatively high rates of psychological distress frequently reported in this population.

By identifying and considering modifiable correlates of risky sexual behavior, interventions can best be designed and tested for reducing sexual risk taking in adolescent survivors of childhood cancer. By reducing this behavior, one should expect subsequent declines in unintended pregnancy, STIs, and associated cancers. The pursuit of this work will not only result in improved health, but in quality of life outcomes in this vulnerable group.

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Figure 1.
Flowchart depicting participant recruitment and questionnaire completion for adolescent survivors.

Table 1

Demographic, Diagnostic, and Treatment Characteristics of Adolescent Survivors of Childhood Cancer

	Survivors (<i>N</i> = 307)	
	<i>N</i>	%
Gender		
Male	123	40.1
Female	184	59.9
Age in Years		
15–17	129	42.0
18–20	178	58.0
Race		
White	272	88.6
Non-White	35	11.4
Education Status		
In School	178	58.0
Not in School	88	28.6
Not indicated	41	13.4
Parent Education		
Did not complete high school	11	3.6
High School or some college	113	36.8
College or higher	172	56.0
Don't know	11	3.6
Parent Work Status		
Employed	300	97.7
Unemployed	4	1.3
Retired	2	0.7
Student	1	0.3
Household Income		
<60,000/yr	159	51.8
60,000+/yr	145	47.2
Unknown	3	1.0
Medical Insurance		
Yes	250	81.4
No	30	9.8
Canadian resident	26	8.5
Missing	1	0.3
Receiving Welfare		
No	291	94.8
Yes	5	1.6
Don't know	11	3.6
Receiving Food Stamps		
No	298	97.0

Survivors (N = 307)		
	N	%
Yes	6	2.0
Don't know	3	1.0
Free Lunch		
No	286	93.1
Yes	19	6.2
Don't know	2	0.7
Not indicated	0	0.0
Age in Years at Diagnosis		
0–1	198	64.5
2–3	109	35.5
Time since Diagnosis		
<15 years	6	2.0
15–20 years	300	97.7
>20 years	1	0.3
Diagnosis		
CNS	40	13.0
Leukemia	95	30.9
Non-Hodgkin's Lymphoma	4	1.3
Wilms tumor	56	18.2
Neuroblastoma	90	29.3
Soft tissue sarcoma	19	6.3
Bone cancer	3	1.0
Treatment Modalities		
Surgery only	41	13.4
Radiation therapy (no chemo)	11	3.6
Chemotherapy + radiation	99	32.2
Chemotherapy (no radiation)	144	46.9
No chemo, surgery, or radiation	2	0.7
Unknown	10	3.3
CNS Treatment		
No CNS treatment	193	62.9
Any CNS treatment	114	37.1

Table 2

Sociodemographic, Medical, Behavioral and Psychological Characteristics by Risky Sexual Behavior of Adolescent Survivors of Childhood Cancer

	History of Sexual Intercourse (N= 307)			Early Initiation of Sexual Intercourse (n= 110)			Multiple Sexual Partners (n= 110)			Pregnancy Prevention at Last Intercourse (n=110)			STI Prevention at Last Intercourse (n= 110)		
	Yes N (%)	No N (%)		Yes N (%)	No N (%)		Yes N (%)	No N (%)		Yes N (%)	No N (%)		Yes N (%)	No N (%)	
Gender															
Male	35 (28.5)	88 (71.5)*		9 (25.7)	26 (74.3)		18 (54.6)	15 (45.4)		28 (84.8)	5 (15.2)		28 (80.0)	7 (20.0)	
Female	75 (41.2)	107 (58.8)		29 (38.7)	46 (61.3)		46 (61.3)	29 (38.7)		64 (85.3)	11 (14.7)		51 (68.0)	24 (32.0)	
Age in Years															
15-17	34 (26.8)	93 (73.2)**		18 (52.9)	16 (47.1)**		19 (55.9)	15 (44.1)		28 (82.4)	6 (17.6)		26 (76.5)	8 (23.5)	
18-20	76 (42.7)	102 (57.3)		20 (26.3)	56 (73.7)		45 (60.8)	29 (39.2)		64 (86.5)	10 (13.5)		53 (69.7)	23 (30.3)	
Race															
White	97 (35.9)	173 (64.1)		32 (33.0)	65 (67.0)		56 (57.7)	41 (42.3)		82 (84.5)	15 (15.5)		70 (72.2)	27 (27.8)	
Non-White	13 (37.1)	22 (62.9)		6 (46.2)	7 (53.8)		8 (72.7)	3 (27.3)		10 (90.9)	1 (9.1)		9 (69.2)	4 (30.8)	
Education Status															
In School	48 (27.3)	128 (72.7)**		20 (41.7)	28 (58.3)		27 (56.3)	21 (43.7)		42 (87.5)	6 (12.5)		38 (79.2)	10 (20.8)	
Not in School	49 (55.7)	39 (44.3)		14 (28.6)	35 (71.4)		26 (55.3)	21 (44.7)		41 (87.2)	6 (12.8)		33 (67.3)	16 (32.7)	
Not indicated	13 (31.7)	28 (68.3)		4 (30.8)	9 (69.2)		11 (84.6)	2 (15.4)		9 (69.2)	4 (30.8)		8 (61.5)	5 (38.5)	
Parent Education															
< College graduate	53 (43.1)	70 (56.9)*		19 (35.9)	34 (64.1)		37 (69.8)	16 (30.2)*		48 (90.6)	5 (9.4)+		43 (81.1)	10 (18.9)*	
College graduate	54 (31.6)	117 (68.4)		17 (31.5)	37 (68.5)		26 (49.1)	27 (50.9)		42 (79.2)	11 (20.8)		34 (63.0)	20 (37.0)	
Don't know	3 (27.3)	8 (72.7)		2 (66.7)	1 (33.3)		1 (50.0)	1 (50.0)		2 (100)	-		2 (66.7)	1 (33.3)	
Time since diagnosis															
Median split low	42 (27.8)	109 (72.2)**		18 (42.9)	24 (57.1)+		21 (52.5)	19 (47.5)		32 (80.0)	8 (20.0)		26 (61.9)	16 (38.1)+	
Median split high	68 (44.2)	86 (55.8)		20 (29.4)	48 (70.6)		43 (63.2)	25 (36.8)		60 (88.2)	8 (11.8)		53 (77.9)	15 (22.1)	
Diagnosis															
Leukemia	33 (34.7)	62 (65.3)*		12 (36.4)	21 (63.6)+		24 (75.0)	8 (25.0)		28 (87.5)	4 (12.5)		23 (69.7)	10 (30.3)	

	History of Sexual Intercourse (N= 307)		Early Initiation of Sexual Intercourse (n= 110)		Multiple Sexual Partners (n= 110)		Pregnancy Prevention at Last Intercourse (n=110)		STI Prevention at Last Intercourse (n= 110)	
	Yes N (%)	No N (%)	Yes N (%)	No N (%)	Yes N (%)	No N (%)	Yes N (%)	No N (%)	Yes N (%)	No N (%)
CNS	9 (22.5)	31 (77.5)	5 (55.6)	4 (44.4)	5 (55.6)	4 (44.4)	8 (88.9)	1 (11.1)	7 (77.8)	2 (22.2)
Neuroblastoma	29 (33.0)	59 (67.0)	13 (44.8)	16 (55.2)	16 (55.2)	13 (44.8)	26 (89.7)	3 (10.3)	25 (86.2)	4 (13.8)
Other	39 (47.6)	43 (52.4)	8 (20.5)	31 (79.5)	19 (50.0)	19 (50.0)	30 (78.9)	8 (21.1)	24 (61.5)	15 (38.5)
Treatment Modalities										
Surgery only	17 (41.5)	24 (58.5) ⁺	6 (35.3)	11 (64.7)	9 (52.9)	8 (47.1)	15 (88.2)	2 (11.8)	14 (82.4)	3 (17.6)
Radiation therapy only	2 (18.2)	9 (81.8)	2 (100)	-	1 (50.0)	1 (50.0)	2 (100)	-	1 (50.0)	1 (50.0)
Chemotherapy only	58 (40.3)	85 (59.0)	20 (34.5)	38 (65.5)	34 (58.6)	24 (41.4)	52 (89.7)	6 (10.3)	44 (75.9)	14 (24.1)
Chemotherapy + RT	25 (25.5)	73 (74.5)	6 (24.0)	19 (76.0)	14 (58.3)	10 (41.7)	18 (75.0)	6 (25.0)	15 (60.0)	10 (40.0)
No treatment	-	2 (100)	-	-	-	-	-	-	-	-
Unknown	8 (80.0)	2 (20.0)	4 (50.0)	4 (50.0)	6 (85.7)	1 (14.3)	5 (71.4)	2 (28.6)	5 (62.5)	3 (37.5)
CNS Treatment										
No CNS treatment	77 (40.3)	114 (59.7) ⁺	24 (31.2)	53 (68.8)	40 (52.6)	36 (47.4) [*]	65 (85.5)	11 (14.5)	58 (75.3)	19 (24.7)
Any CNS treatment	33 (29.0)	81 (71.0)	14 (42.4)	19 (57.6)	24 (75.0)	8 (25.0)	27 (84.4)	5 (15.6)	21 (63.6)	12 (36.4)
Cigarette Use										
Current	33 (73.3)	12 (26.7) ^{**}	16 (48.5)	17 (51.5) ⁺	28 (84.9)	5 (15.1) ^{**}	26 (78.8)	7 (21.2)	39 (72.2)	15 (27.8)
Past	26 (65.0)	14 (35.0)	9 (34.6)	17 (65.4)	14 (53.9)	12 (46.1)	23 (88.5)	3 (11.5)	28 (77.8)	8 (22.2)
Never	51 (23.4)	167 (76.6)	13 (25.5)	38 (74.5)	22 (44.9)	27 (55.1)	43 (87.8)	6 (12.2)	12 (60.0)	8 (40.0)
Unknown	-	2 (100)	-	-	-	-	26 (78.8)	7 (21.2)	39 (72.2)	15 (27.8)
Beer/wine Use										
Current	54 (62.1)	33 (37.9) ^{**}	22 (40.7)	32 (59.3)	36 (66.7)	18 (33.3)	44 (81.5)	10 (18.5)	39 (72.2)	15 (27.8)
Past	36 (43.9)	46 (56.1)	10 (27.8)	26 (72.2)	18 (51.4)	17 (48.6)	31 (88.6)	4 (11.4)	28 (77.8)	8 (22.2)
Never	20 (14.7)	116 (85.3)	6 (30.0)	14 (70.0)	10 (52.6)	9 (47.4)	17 (89.5)	2 (10.5)	12 (60.0)	8 (40.0)
Binge drinking										
Current	33 (64.7)	18 (35.3) ^{**}	11 (33.3)	22 (66.7)	23 (69.7)	10 (30.3) ^{**}	26 (78.8)	7 (21.2)	23 (69.7)	10 (30.3)
Past	37 (72.6)	14 (27.4)	14 (37.8)	23 (62.2)	25 (69.4)	11 (30.6)	31 (86.1)	5 (13.9)	28 (75.7)	9 (24.3)
Never	40 (19.8)	162 (80.2)	13 (32.5)	27 (67.5)	16 (41.0)	23 (59.0)	35 (89.7)	4 (10.3)	28 (70.0)	12 (30.0)

	History of Sexual Intercourse (N= 307)		Early Initiation of Sexual Intercourse (n= 110)		Multiple Sexual Partners (n= 110)		Pregnancy Prevention at Last Intercourse (n=110)		STI Prevention at Last Intercourse (n= 110)	
	Yes N (%)	No N (%)	Yes N (%)	No N (%)	Yes N (%)	No N (%)	Yes N (%)	No N (%)	Yes N (%)	No N (%)
Unknown	-	1 (100)	-	-	-	-	-	-	-	-
Marijuana Use										
Current	26 (72.2)	10 (27.8)**	9 (34.6)	17 (65.4) ⁺	21 (84.0)	4 (16.0)**	22 (88.0)	3 (12.0)	19 (73.1)	7 (26.9)
Past	34 (81.0)	8 (19.0)	16 (47.1)	18 (52.9)	19 (57.6)	14 (42.4)	26 (78.8)	7 (21.2)	24 (70.6)	10 (29.4)
Never	50 (22.1)	176 (77.9)	13 (26.0)	37 (74.0)	24 (48.0)	26 (52.0)	44 (88.0)	6 (12.0)	36 (72.0)	14 (28.0)
Unknown	-	1 (100)	-	-	-	-	-	-	-	-
Self-esteem										
At-risk	12 (40.0)	18 (60.0)	7 (58.3)	5 (41.7) ⁺	9 (75.0)	3 (25.0)	7 (58.3)	5 (41.7)*	5 (41.7)	7 (58.3)*
Not at risk	98 (35.6)	177 (64.4)	31 (31.6)	67 (68.4)	55 (57.3)	41 (42.7)	85 (88.5)	11 (11.5)	74 (75.5)	24 (24.5)
Emotional discomfort										
At-risk	21 (43.8)	27 (56.2)	13 (61.9)	8 (38.1)**	16 (76.2)	5 (23.8) ⁺	14 (66.7)	7 (33.3)*	8 (38.1)	13 (61.9)**
Not at risk	88 (34.7)	166 (65.3)	25 (28.4)	63 (71.6)	48 (55.8)	38 (44.2)	77 (89.5)	9 (10.5)	70 (79.6)	18 (20.4)
Academic performance										
At-risk	10 (52.6)	9 (47.4) ⁺	5 (50.0)	5 (50.0)	9 (90.0)	1 (10.0) ⁺	8 (80.0)	2 (20.0)	8 (80.0)	2 (20.0)
Not at risk	96 (34.7)	181 (65.3)	30 (31.3)	66 (68.7)	53 (56.4)	41 (43.6)	80 (85.1)	14 (14.9)	68 (70.8)	28 (29.2)
Threat to achievement										
At-risk	8 (72.7)	3 (27.3)*	6 (75.0)	2 (25.0)*	7 (87.5)	1 (12.5) ⁺	5 (62.5)	3 (37.5) ⁺	5 (62.5)	3 (37.5)
Not at risk	102(34.7)	192 (65.3)	32 (31.4)	70 (68.6)	57 (57.0)	43 (43.0)	87 (87.0)	13 (13.0)	74 (72.6)	28 (27.4)
Peer influences										
At-risk	49 (76.6)	15 (23.4)**	20 (40.8)	29 (59.2)	37 (78.7)	10 (21.3)**	38 (80.9)	9 (19.1)	34 (69.4)	15 (30.6)
Not at risk	61 (25.4)	179 (74.6)	18 (29.5)	43 (70.5)	27 (44.3)	34 (55.7)	54 (88.5)	7 (11.5)	45 (73.8)	16 (26.2)

Note. Univariate analyses were performed using Chi-square or Fisher's Exact tests (for $n = 5$) to calculate the p -values. Missing values were ignored.

***
 $p < .01$,

*
 $p < .05$,

$p < .15$ ⁺

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Table 3

Comparison of Sociodemographic and Other Variables of Interest between Adolescent Cancer Survivors With and Without History of Sexual Intercourse

Identified Relevant Variables	Odds Ratio	95% Confidence Interval (CI)	P-value
Gender			
Male	1.00		
Female	2.23	0.99–5.02	0.05
Age			
14–17	1.00		
18–20	1.81	0.70–4.71	0.22
Education Status			
In School	1.00		
Not in School	1.86	0.69–5.01	0.22
Not indicated	-	-	-
Parent Education			
Less than college grad	1.00		
College grad or higher	0.58	0.27–1.25	0.17
Don't know	-	-	-
Time since diagnosis			
Median split low	1.00		
Median split high	1.55	0.65–3.70	0.33
Diagnosis			
Leukemia	1.00		
CNS	0.13	0.02–0.96	0.05
Neuroblastoma	0.32	0.07–1.47	0.14
Other	0.89	0.21–3.80	0.87
CNS Treatment			
No CNS treatment	1.00		
CNS treatment	0.37	0.09–1.52	0.17
Cigarette Use			
Current	1.00		
Past	1.62	0.37–7.01	0.52
Never	0.61	0.18–2.12	0.44
Unknown	-	-	-
Beer/wine Use			
Current	1.00		
Past	0.62	0.18–2.08	0.44
Never	0.20	0.06–0.68	0.01
Unknown	-	-	-
Binge Drinking			
Current	1.00		
Past	3.02	0.64–14.15	0.16

Identified Relevant Variables	Odds Ratio	95% Confidence Interval (CI)	P-value
Never	1.31	0.33–5.21	0.70
Unknown	-	-	-
Marijuana Use			
Current	1.00		
Past	1.80	0.33–9.79	0.49
Never	0.29	0.07–1.33	0.11
Unknown	-	-	-
Academic performance			
At-risk	1.00		
Not at risk	3.25	0.58–18.14	0.18
Missing	-	-	-
Threats to achievement			
At-risk	1.00		
Not at risk	0.60	0.09–4.02	0.60
Missing	-	-	-
Peer influences			
At-risk	1.00		
Not at risk	0.28	0.09–0.84	0.02
Missing	-	-	-

Note. N = 307

Table 4

Comparison of Sociodemographic and Other Variables of Interest for Sexually Active Adolescent Cancer Survivors by No Condom Use at Last Intercourse

Identified Relevant Variables	Odds Ratio	95% Confidence Interval (CI)	P-value
Parent Education			
Less than college grad	1.00		
College grad or higher	4.27	1.46–12.52	0.01
Don't know	-	-	-
Time since diagnosis			
Median split low	1.00		
Median split high	0.27	0.10–0.78	0.02
Self-Esteem			
At-risk	1.00		
Not at risk	0.78	0.16–3.78	0.76
Missing	-	-	-
Emotional discomfort			
At-risk	1.00		
Not at risk	0.09	0.02–0.36	<0.01
Missing	-	-	-