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Substance use among adolescent and young adult cancer survivors

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Abstract

***Objective*: Health-promoting behaviors are recommended to childhood cancer survivors (CCS) to reduce late effects resulting from cancer treatment. Understanding factors associated with substance use is needed, especially among Hispanic CCS who are underrepresented in previous studies. The objective of this study is to examine substance use behaviors of recently treated Hispanic and non-Hispanic CCS.**

***Methods*: One hundred ninety-three Los Angeles County CCS who were diagnosed between 2000 and 2007 (54% Hispanic; mean age 19.9 years, SD = 2.8; mean age at diagnosis = 12.1, SD = 3.0; mean years since diagnosis = 7.8, SD = 2.0) provided self-reported information on substance use, demographics, clinical factors, religiosity, and depressive symptoms. Risk and protective factors for substance use were examined using multivariable logistic regression.**

***Results*: Prevalence of 30-day substance use was 11%, 25%, and 14% for tobacco, alcohol, and marijuana, respectively. In controlled regression models, age was positively associated with tobacco use, binge drinking, and polysubstance use (use of at least two of the three substances). Male gender, higher depressive symptoms, and higher socioeconomic status were associated with greater marijuana use. In addition, religiosity was negatively associated with the use of all substances.**

***Conclusions*: The prevalence rates for substance use in this ethnically diverse representative sample of CCS are lower than those observed in the general population. Older CCS were at higher risk of substance use, and depression was associated with greater marijuana use. No differences by ethnicity were observed. Interventions for substance use prevention/cessation among CCS may be most effective if implemented before the age of 21 years and address mental health as part of survivorship care.**

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Introduction

Although treatment advances have dramatically increased survival for childhood cancer [1,2], the majority of survivors subsequently experience early life morbidity [3] and mortality [4,5]. Thus, life-long practice of health-promoting behaviors, including substance use avoidance, is recommended for childhood cancer survivors (CCS) in order to potentially delay or mitigate early life morbidity and mortality, including cancer treatment-related late effects. For example, the Children's Oncology Group (COG) Long-Term Follow-Up Guidelines for Survivors of Childhood, Adolescent, and Young Adult Cancers recommend that all CCS receive counseling about substance use and referral to appropriate clinics (e.g., tobacco cessation) as needed [2,6].

Despite the potential contributing effects of negative health behaviors on subsequent health, young cancer survivors do engage in 'typical' behaviors for their peer groups that include smoking, drug and alcohol use, sun exposure, obesity, and unprotected sex [7]. Generally, 16–29% and 55–90% of CCS report tobacco or alcohol use, respectively [8], which are comparable with, or less than, those of their healthy peers [9–11]. For example, one study found CCS to be significantly less likely to be smokers compared with sibling controls [12,13]. This suggests that some CCS make efforts to follow a healthy lifestyle after treatment has ended.

Knowledge of current levels of substance use among CCS is limited because prior work did not include an adequate representation of Hispanic CCS, did not include more recently treated CCS, and/or was based on relatively low levels of volunteer responses [3,4]. Only 5% of the Childhood Cancer Survivor Study (CCSS) cohort is Hispanic [14], compared with 16.9% in the US population as a whole [15]. Further, because data from the CCSS only include patients diagnosed between 1970 and 1986, substance use patterns among more recently treated CCS are less clear. In as much as significant nationwide improvements in survivorship care and reductions in the

prevalence of substance use (e.g., smoking rates) have occurred in the past 30 years, having more recent data on CCS habits are important to determine whether these trends reflect this vulnerable group.

Among adolescents and young adults (AYA) without cancer, previous research has shown that higher substance use is associated with older age and higher levels of depression [16] and less likely to occur among those with greater religiosity [17] and post-traumatic growth (PTG; defined as the experience of perceived benefits/found meaning from a negative life event) [18]. Studies of CCS have shown that 15–30% show some adjustment and/or emotional problems [19], which may increase their risk of substance use; however, many CCS also experience positive transformations in their lives[18,20–22], such as reporting PTG from their cancer experience [23], which may reduce their risk of unhealthly lifestyle behaviors. Although prior work among non-CCS adolescents indicates an inverse relationship between post-traumatic growth (stemming from a variety of negative life events such as the death of a loved one, parents getting divorced, or the 9/11 terrorist attacks) and substance use (e.g., alcohol) [18,20,24,25], it is unclear whether post-traumatic growth stemming from a childhood cancer experience would show a similar protective relationship.

The purpose of this analysis was to identify risk and protective factors for substance use among recently treated Hispanic and non-Hispanic AYA CCS (between 15 and 25 years old) in Los Angeles County (LAC). (In LAC, 61.7% of children under the age of 14 years diagnosed with cancer from 2004 to 2008 were Hispanic [26].) We examined both demographic and clinical factors to help determine whether specific subgroups of CCS would be at greater risk for substance use. Consistent with prior research on substance use among AYAs, we hypothesized that tobacco, alcohol, and marijuana use would be positively associated with age and depressive symptoms and inversely associated with religiosity and posttraumatic growth.

Methods

The CCS included in this analysis participated in the Project Forward study, a representative cohort of CCS who were diagnosed with any type of cancer (except Hodgkin's Disease) between ages 5–18 years at Children's Hospital Los Angeles (CHLA) or at Miller Children's Hospital (MCH) in Long Beach between 2000 and 2007, and whose age in 2009 was between 15 and 25 years. Methods/procedures have been previously described [27,28]. Briefly, CCS meeting the selection criteria were identified through the Los Angeles Cancer Surveillance Program, the Surveillance, Epidemiology, and End Results (SEER) Cancer Registry covering Los Angeles County and mailed a survey to complete and return in a postage-paid envelope. Telephone interviews ($n=4$) and online completion ($n=27$) of the survey were also made available. Extensive follow-up was conducted in the form of telephone calls, drop by visits, and second mailings. The study was approved by the California Committee for the Protection of Human Subjects, the California Cancer Registry, and the Institutional Review Boards at the University of Southern California, CHLA, and MCH.

Measures

Substance use: Cigarette and marijuana use was defined as any reported use (at least once) in the prior 30 days. Binge drinking was defined as having five or more drinks on the same occasion at least once in the prior 30 days, based on the Centers for Disease Control (CDC) Youth Risk Behavior Survey [29]. In addition, a combination variable, polysubstance use, was created based on the use of at least two of these three substances within the last 30 days.

Demographics: This included current age, age at diagnosis, race/ethnicity, education level, and socioeconomic level (status based on census tract of address at diagnosis; from the Cancer Registry), and these variables were categorized as shown in Table 1.

Clinical factors, obtained from the cancer registry included date of diagnosis, cancer site (e.g., leukemia, lymphoma, and brain/CNS), and hospital where diagnosed (CHLA or Miller's).

Treatment intensity: Intensity of prior cancer treatment was categorized using the Intensity of Treatment Rating Scale 2.0 (ITR-2) [30]. The ITR is a validated scale based upon cancer registry data and medical chart review, including cancer site, stage at diagnosis, treatment modalities, and relapse history. Treatment was categorized by four levels of intensity: 1 = least intensive (e.g., surgery only), 2 = moderately intensive (e.g., chemotherapy or radiation), 3 = very intensive (e.g., two or more treatment modalities), and 4 = most intensive (e.g., regimens for relapsed disease, including bone marrow transplantation).

Post-traumatic growth inventory (PTGI): The PTGI short form is a 10-item measure of personal growth experienced by individuals who have experienced a traumatic event, in this case, cancer [31]. Items reflect different areas of growth, including relating to others, new possibilities, personal strength, spiritual change, and appreciation of life. Each item is based on a 6-point scale ranging from 0 ('I did not experience this change as a result of my crisis.') to 5 ('I experienced this change to a very great degree as a result of my crisis.'). A PTG total mean score was calculated, where higher scores indicate more post-traumatic growth. The Cronbach's alpha for this scale was .90.

Depressive symptoms: The 20-item Center for Epidemiological Studies Depression Scale (CES-D) was used

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Table 1. Demographic and cancer diagnoses of participants and bivariate associations with substance use ($n = 193$)

			Type of substance use (past 30 days)			
			Tobacco	Binge drinking	Marijuana	Polysubstance use
	No.	%	% yes	% yes	% yes	% yes
Characteristic			**11.46%**	**24.87%**	**13.68%**	**16.06%**
Demographic factors						
Gender			$\chi^2 = 0.21$	$\chi^2 = .002$	$\chi^2 = 1.75$	$\chi^2 = 0.90$
			$p = .65$	$p = .97$	$p = .19$	$p = .34$
Female	96	49.7	10.4	25.0	10.4	13.5
Male	97	50.3	12.5	24.7	17.0	18.6
Race/ethnicity			$\chi^2 = 2.81$	$\chi^2 = 1.60$	$\chi^2 = 2.88$	$\chi^2 = 2.59$
			$p = .25$	$p = .45$	$p = .25$	$p = .27$
Hispanic/Latino	105	54.4	13.5	23.8	11.8	15.2
White	55	28.5	12.7	21.8	20.0	21.8
Other	33	17.1	3.0	33.3	9.1	9.1
Age			$\chi^2 = .80$	$\chi^2 = 17.50$	$\chi^2 = 1.87$	$\chi^2 = .2.95$
			$p = .37$	$p < .0001$	$p = .17$	$p = .09$
15–20 years	114	59.1	9.7	14.0	10.8	12.3
21+ years old	79	40.9	13.9	40.5	17.7	21.5
Cancer diagnosis/site			$\chi^2 = 2.81$	$\chi^2 = 2.93$	$\chi^2 = 3.95$	$\chi^2 = 4.25$
			$p = .59$	$p = .67$	$p = .41$	$p = .37$
Leukemia	57	29.5	10.5	29.5	14.3	14.0
Brain/CNS	31	16.1	12.9	22.6	12.9	16.1
Bone	10	5.2	0.0	10.0	0.0	0.0
Lymphoma	38	19.7	7.9	31.6	8.1	13.2
Other	57	29.5	15.8	26.3	19.3	22.8

to assess symptoms of depression [32]. Participants indicated how often they had experienced symptoms (e.g., depressed mood, loss of appetite, sleep and psychomotor disruption, and feelings of guilt and worthlessness and/or helplessness and hopelessness) during the previous week on a 4-point ordinal scale ranging from 'rarely or none of the time' (less than 1 day) to 'most or all of the time' (5–7 days). A total score was calculated with higher scores representing elevated levels of depressive symptoms. The Cronbach's alpha in this sample was .92. In sensitivity analyses, we repeated all analyses utilizing a dichotomous CES-D score (coded 1/0, using a cut point of 16). Because the pattern of results was similar, we only present the findings from the continuous CES-D score.

Religiosity: This construct was screened with a single item question regarding the number of times the participant attended church/religious services. Scores were recorded as 0 = never/don't know, 1 = every few years, 2 = several times per year, 3 = two to three times per month, or 4 = at least once per week, and used as a continuous measure where higher scores indicated more religious worship.

Statistical analysis

Descriptive data (demographic and clinical characteristics) were examined, including the prevalence of smoking, binge drinking, and marijuana use. Bivariate analysis of the different substance use outcomes was examined by categories of the demographic, clinical, and psychological variables using chi-square and *t*-tests. Multivariable logistic regression analyses were performed to assess factors associated with each of the substance use variables, as well as use of polysubstance (i.e., endorsement of at least two substances). After including demographics (age, sex, race/ethnicity, and SES) in each model, other variables that demonstrated a univariate association with each outcome variable (at $p \leq 0.10$) were selected for inclusion in final multivariable logistic regression models. Data analyses were conducted using SAS statistical software (Version 9.2) (SAS Institute; Cary, NC, USA).

Results

A total of 235 CCS participated in the study out of 470, resulting in a 50% response rate. We assessed characteristics of non-respondents using cancer registry data and found no differences with respondents by age, cancer type (SEER diagnosis), year of diagnosis, age at diagnosis, or race/ethnicity. Women were more likely to respond than men (56.4% vs. 44.8%; $p < .05$) and those of high socioeconomic status (SES; SEER data based on census tract of address at diagnosis) were more likely to respond than those of low SES status ($p < .05$). (However, among Hispanics, there was no response difference by SES). Among the respondents, 42 indicated that they were still receiving treatment, and thus, 193 were included in the analytic sample. Participants (Tables 1 and 2) were evenly divided by sex and over half were Hispanic (54.4%). Age at

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Table 2. Psychosocial and other characteristics of participants and bivariate associations with substance use ($n = 193$)

			Tobacco		Binge drinking		Marijuana		Polysubstance use	
Psychosocial factors	**M**	**(SD)**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**
Post-traumatic growth	35.71	(10.81)	36.0 (9.9) $t = 0.15$	35.7 (10.9) $p = .87$	36.0 (9.0) $t = 0.18$	35.6 (11.4) $p = .85$	34.6 (10.3) $t = 0.58$	35.9 (11.0) $p = .56$	35.4 (9.2) $t = 0.15$	35.8(11.1) $p = .88$
Depressive symptoms	13.95	(11.23)	19.0 (10.6) $t = 2.29$	13.2 (11.1) $p = .02$	16.6 (12.2) $t = 1.84$	13.1 (10.8) $p = .07$	16.5 (11.0) $t = 1.26$	13.4 (11.1) $p = .21$	18.2 (11.1) $t = 2.26$	13.2 (11.1) $p = .03$
Religiosity	1.82	(1.43)	1.32(1.1) $t = 2.19$	1.90(1.4) $p = .04$	1.42 (1.2) $t = 2.55$	1.96 (1.5) $p = .01$	1.50 (1.2) $t = 1.41$	1.87 (1.4) $p = .17$	1.39 (1.1) $t = 2.01$	1.91 (1.5) $p = .05$
Other factors										
Current age	19.87	(2.83)	20.9(2.3) $t = -1.76$	19.7 (2.9) $p = .05$	21.4 (2.0) $t = -4.60$	19.4 (2.9) $p = < .001$	21.4 (2.1) $t = -4.60$	19.4 (2.9) $p < .001$	20.9 (2.2) $t = -2.24$	19.7 (2.9) $p = .03$
Time since diagnoses	7.78	(2.00)	7.9 (2.1) $t = 0.20$	7.8 (2.0) $p = .84$	8.13 (1.9) $t = 1.39$	7.7 (2.0) $p = .17$	8.3 (2.1) $t = 1.42$	7.7 (2.0) $p = .16$	8.3 (2.1) $t = 1.47$	7.7 (2.0) $p = .15$
SES (1 :low–5 :high)	2.84	(1.47)	2.68 (1.5) $t = 0.54$	2.86 (1.5) $p = .59$	2.77 (1.4) $t = 0.42$	2.87 (1.5) $p = .68$	2.77 (1.4) $t = 0.42$	2.87 (1.5) $p = .69$	3.00 (1.5) $t = -0.67$	2.65 (0.8) $p = .50$
Treatment Intensity	2.62	(0.79)	2.36 (.79) $t = 1.61$	2.65 (.79) $p = .12$	2.56 (.85) $t = 0.55$	2.64 (.77) $p = .58$	2.54 (.81) $t = 0.58$	2.64 (.79) $p = .56$	2.56 (.86) $t = -0.67$	2.65(.76) $p = .50$

participation ranged from 15–25 years (mean = 19.87, SD = 2.82), with 41% 21 years or older. The majority had at least a high school education (70.7%).

Clinical characteristics: The most common types of cancer were leukemia (29%), lymphoma (19%), and brain/central nervous system (16%). The majority of patients (81%) received 'moderate/very' intensive treatments. Age at diagnosis ranged from 5 to 19 years old (mean = 12.1, SD = 3.0), and years since diagnosis ranged from 4 to 12 years (mean = 7.8, SD = 2.0).

Psychosocial characteristics: PTGI scores ranged from 0 to 50 (M = 35.71, SD = 10.81). CES-D scores ranged from 0 to 46 (M = 13.95, SD = 11.23). Thirty-one percent ($n = 60$) scored at least 16 on the CES-D. Religiosity scores ranged from 0 to 4 (M = 1.82, SD = 1.43).

Factors related to tobacco use: Prevalence of 30-day tobacco use was 11%. Based on univariate tests, those who used tobacco had more depressive symptoms, were older in age, and had less religiosity than non-tobacco users. In a multivariable logistic regression model (Table 3), older age remained significantly associated with tobacco use.

Factors related to binge drinking: Prevalence of 30-day binge drinking was 25%. Based on univariate tests, those who reported binge drinking were older in age, more educated with at least a high school diploma, and had less religiosity. In a multivariable logistic regression model (Table 3), older age and more depressive symptoms were significantly associated with binge drinking.

Factors related to marijuana use: Prevalence of 30-day marijuana use was 14%. Based on univariate tests, those who reported marijuana use were older in age. In a multivariable logistic regression model (Table 3), higher depressive symptoms, being male (versus female), and higher socioeconomic status were significantly associated with marijuana use.

Table 3. Multivariable logistic regression models of substance use ($n = 193$)

	Substance															
	Tobacco				Binge drinking				Marijuana				Polysubstance use			
Characteristic	**Adjusted odds ratio**	**95% CI**	**95% CI**	***p***	**Adjusted odds ratio**	**95% CI**	**95% CI**	***p***	**Adjusted odds ratio**	**95% CI**	**95% CI**	***p***	**Adjusted odds ratio**	**95% CI**	**95% CI**	***p***
Depressive symptoms	1.04	1.00	1.08	0.06	1.03	1.00	1.07	0.05	1.04	1.01	1.09	0.04	1.03	1.00	1.06	0.10
Religiosity	0.82	0.58	1.19	0.30	0.80	0.61	1.05	0.10	0.89	0.62	1.28	0.54	0.77	0.59	0.99	0.04
Current age	1.20	1.01	1.44	0.04	1.33	1.61	1.55	.001	1.15	0.97	1.36	0.11	1.33	1.17	1.52	.001
Gender																
Female (versus male)	0.55	0.20	1.55	0.26	0.87	0.41	1.84	0.72	.33	0.12	0.91	0.03	0.81	0.40	1.62	0.54
Race/ethnicity																
White	1.0				1.0				1.0				1.0			
Hispanic/Latino (vs. White)	1.05	0.22	4.94	0.25	1.10	0.34	3.60	0.77	2.26	0.55	9.34	0.12	1.84	0.61	5.49	0.29
Other (vs. White)	0.18	0.02	1.73	0.11	1.61	0.52	5.04	0.37	0.64	0.14	2.93	0.23	1.25	0.42	3.74	0.86
SES	1.03	0.64	1.67	0.90	0.96	0.68	1.35	0.82	2.06	1.28	3.30	.002	1.22	0.89	1.68	0.22
Treatment intensity	0.58	0.31	1.08	0.09	0.90	0.57	1.43	0.66	0.88	0.49	1.60	0.68	0.87	0.56	1.33	0.52

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Factors related to polysubstance use: Prevalence of using at least two of the three substances was 16%. The interrelationships between the substances, smoking and marijuana use ($r = .28$), binge drinking and smoking ($r = .39$), and binge drinking and marijuana use ($r = .40$) were significant (all p's $< .01$). Based on univariate tests, those who reported polysubstance use had higher depressive symptoms, had lower levels of religiosity, and were older in age. Twelve percent of CCS under the age of 21 years reported polysubstance use versus 22% of those aged 21 years and older. In a multivariable logistic regression model (Table 3), only lower religiosity and older age were significantly associated with polysubstance use.

Discussion

We found that among CCS diagnosed between 2000 and 2007 at two major pediatric hospitals in Los Angeles County, who were now AYAs (between 15 and 25 years of age), substance use was higher among older CCS. This increase in substance use with age, primarily driven by alcohol consumption, is similar to data from the general US population (e.g., YRBSS). Thus, broader education efforts among CCS concerning risk behaviors may be best focused when CCS transition from pediatric to adult care settings (i.e., during the ages from 18 to 21 years).

Substance use among the CCS in this study is lower than those in the general population. For example, among high schools students nationwide, the 30-day percentage of students who smoke cigarettes, binge drink, or smoke marijuana is 15%, 21%, and 23%, respectively [33]. Among those high school-aged CCS in this study (ages 15–17 years), the 30-day percentage of students who smoke cigarettes, binge drink, or smoke marijuana was 0.0%, 0.0%, and 0.53%, respectively. Among young adults (ages 18–25 years) sampled nationwide [34], the 30-day percentage (2013) of young adults who smoked cigarettes or marijuana was 31% and 19%, respectively (vs. 11.5% and 13.2%, respectively, among similar aged CCS in this sample). The nationwide 2013 percentage of young adults who binge drink was 29% for those aged 18 to 20 years and 43% for those aged 21 to 25 years (vs. 8.3% and 16.6%, respectively, among similar aged CCS in this sample). These lower rates may reflect a greater concern by CCS about their health. Because substance use initiation is impacted by social influence, an alternate explanation would be that these lower rates of substance use among CCS are due to delayed social development (i.e., missed/lost social experiences). Future research is needed to further examine this possibility.

Substance use did not vary by clinical factors. These results suggest that health promotion interventions are needed regardless of cancer diagnosis or time since diagnosis/treatment. Because rates of substance use were not significantly lower among CCS who received the most intensive therapies (i.e., those who are at greater risk for treatment-related effects on morbidity/mortality later in life), extra efforts should be made for interventions among this subgroup.

We did not find that substance use varied by ethnicity. There is a paucity of research information for Hispanic CCS. For example, in a CCSS report including substance use, only 1.6% of the participants were Hispanic. Although there were no ethnic differences in substance use in this study, additional research is needed, including the assessment of cultural beliefs among Hispanic CCS [21].

Although PTG was not associated with substance use, the presence of depressive symptoms was, particularly for binge drinking and marijuana use. Because the relationship with depressive symptoms was consistent across all outcomes, these data suggest that targeted interventions focused on mental health, and mitigating negative affect among CCS may also benefit substance use behavior. The lack of associations with PTG suggests that programs promoting purpose/meaning that is derived from the cancer experience may not be relevant for substance use behaviors among CCS.

Religiosity was inversely associated with tobacco use, binge drinking, and polysubstance use. Prior work among adolescents has found religiosity/spirituality to be a consistent protective factor for substance use [17]. These results suggest that tailoring intervention efforts, by incorporating existing religious orientations into successful adaptation to the cancer experience and follow-up, should prove beneficial.

This study is limited because it does not include CCS diagnosed under the age of 5 years and only included CCS who were seen at two prominent hospitals in the Los Angeles area. Although the recruitment rate of 50% for this cancer registry-based study was similar/higher than other recently formed registry cohorts among adolescent and young adults (e.g., 43%; [22]), our results may be biased because 50% did not participate. If a bias did exist, it is likely that more health-conscious CCS would be more likely to respond, and thus, our results could have underestimated substance use in this population. Likewise, our definition of binge drinking was limited to five drinks at one sitting, which is not consistent with a four-drink threshold used to define binge drinking for women. This may have underestimated binge drinking among the women in this sample.

Although the prevalence of substance use among CCS is lower or similar than the general population, it remains a concern for CCS because they are at higher risk to experience early life morbidity and mortality. Thus, substance use prevention and cessation programs should be integrated into the long-term follow-up care of CCS. (e.g., [35]). This study indicates that these programs would benefit CCS at younger ages (under 21 years) and address the mental health (i.e., treatment of depressive symptoms) and religiosity of their patients.

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Conflict of interest

The authors have declared that there is no conflict of interest.

References

1. Prasad PK, Bowles T, Friedman DL. Is there a role for a specialized follow-up clinic for survivors of pediatric cancer? *Cancer Treat Rev* 2010;**36**(4):372–376.
2. Schwartz CLH, Constine LS, Ruccione KS. In *Survivors of Childhood and Adolescent Cancer* (2nd edn), Schwartz CL, Hobbie WL, Constine LS, Ruccione KS (eds.), Pediatric Oncology, vol. **22**. Springer: St. Louis, 2005; 345.
3. Jones BL. Promoting healthy development among survivors of adolescent cancer. *Fam Community Health* 2008;**31**(Suppl 1):S61–S70.
4. Council NR. In *Childhood Cancer Survivorship: Improving Care and Quality of Life*, Hewitt M, Weiner SL, Simone JV (eds.). The National Academies Press: Washington DC, 2003.
5. Mertens AC. Cause of mortality in 5-year survivors of childhood cancer. *Pediatr Blood Cancer* 2007;**48**(7):723–726.
6. Hudson M, Landier ML, Eshelman W *et al.* The children's oncology group long-term follow-up guidelines for survivors of childhood, adolescent, and young adult cancers, Cure Search. 2006.
7. Ford JS, Ostroff JS. Health behaviors of childhood cancer survivors: what we've learned. *J Clin Psychol Med Settings* 2006;**13**(2):151–167.
8. Bauld C, Toumbourou JW, Anderson V, Coffey C, Olsson CA. Health-risk behaviours among adolescent survivors of childhood cancer. *Pediatr Blood Cancer* 2005;**45**(5):706–715.
9. Emmons K, Li FP, Whitton J, *et al*. Predictors of smoking initiation and cessation among childhood cancer survivors: a report from the childhood cancer survivor study. *J Clin Oncol* 2002;**20**(6):1608–1616.
10. Clarke SA, Eiser C. Health behaviours in childhood cancer survivors: a systematic review. *Eur J Cancer* 2007;**43**(9):1373–1384.
11. Klosky JL, Howell CR, Li Z, *et al*. Risky health behavior among adolescents in the childhood cancer survivor study cohort. *J Pediatr Psychol* 2012;**37**(6):634–646.
12. Tao ML, Julianne B, Guo MD, Robert W. Smoking in adult survivors of childhood acute lymphoblastic leukemia. *J Natl Cancer Inst* 1998;**90**(3):219–225.
13. Haupt R, Byrne J, Connelly RR, *et al*. Smoking habits in survivors of childhood and adolescent cancer. *Med Pediatr Oncol* 1992;**20**(4):301–306.
14. Castellino SM, Casillas J, Hudson MM, *et al*. Minority adult survivors of childhood cancer: a comparison of long-term outcomes, health care utilization, and health-related behaviors from the childhood cancer survivor study. *J Clin Oncol* 2005;**23**(27):6499–6507.
15. Census, US. State & county quickfacts. 2012. (Available from: http://quickfacts.census.gov/qfd/states/00000.html [accessed 30 July 2013].)
16. Swendsen JD, Merikangas KR. The comorbidity of depression and substance use disorders. *Clin Psychol Rev* 2000;**20**(2):173–189.
17. Miller L, Davies M, Greenwald S. Religiosity and substance use and abuse among adolescents in the National Comorbidity Survey. *J Am Acad Child Adolesc Psychiatry* 2000;**39**(9):1190–1197.
18. Milam JE, Ritt-Olson A, Unger JB. Posttraumatic Growth among Adolescents. *J Adolesc Res* 2004;**19**(2):192–204.
19. Meeske KA, Ruccione K, Globe DR, Stuber ML. Posttraumatic stress, quality of life, and psychological distress in young adult survivors of childhood cancer. *Oncol Nurs Forum* 2001;**28**(3):481–489.
20. Milam J, Ritt-Olson A, Tan S, Unger J, Nezami E. The September 11th 2001 terrorist attacks and reports of posttraumatic growth among a multi-ethnic sample of adolescents. *Traumatology* 2005;**11**(4):233–246.
21. Casillas J, Kahn KL, Doose M, *et al*. Transitioning childhood cancer survivors to adult-centered healthcare: insights from parents, adolescent, and young adult survivors. *Psycho-Oncology* 2010;**19**(9):982–990.
22. Harlan LC, Lynch CF, Keegan TH, *et al*. Recruitment and follow-up of adolescent and young adult cancer survivors: the AYA HOPE Study. *J Cancer Surviv Res Practice* 2011;**5**(3):305–314.
23. Barakat LP, Alderfer MA, Kazak AE. Posttraumatic growth in adolescent survivors of cancer and their mothers and fathers. *J Pediatr Psychol* 2006;**31**(4):413–419.
24. Love C, Sabiston CM. Exploring the links between physical activity and posttraumatic growth in young adult cancer survivors. *Psycho-Oncology* 2011;**20**(3):278–286.
25. Leung YW, Alter DA, Prior PL, *et al*. Posttraumatic growth in coronary artery disease outpatients: Relationship to degree of trauma and health service use. *J Psychosom Res* 2012;**72**(4):293–299.
26. Liu L, Zhang J, Deapen D. Cancer in Los Angeles County, Incidence and Mortality by Race/Ethnicity, 1988-2009, University of Southern California:Los Angeles. 2902010.
27. Meeske KA, Sherman-Bien S, Hamilton AS, *et al*. Mental health disparities between Hispanic and non-Hispanic parents of childhood cancer survivors. *Pediatr Blood Cancer* 2013;**60**(9):1470–1477.
28. Milam JE, Meeske K, Slaughter RI, *et al*. Cancer-related follow-up care among hispanic and non-Hispanic childhood cancer survivors: the project forward study. *Cancer* 2015;**121**(4):605–613.
29. Brener ND, Kann L, Kinchen SA, *et al*. Methodology of the youth risk behavior surveillance system-2013, US Department of Health and Human Services, Centers for Disease Control and Prevention, 2013.
30. Werba BE, Hobbie W, Kazak AE, *et al*. Classifying the intensity of pediatric cancer treatment protocols: the intensity of treatment rating scale 2.0 (ITR-2). *Pediatr Blood Cancer* 2007;**48**(7):673–677.
31. Cann A, Calhoun LG, Tedeschi RG, *et al*. A short form of the posttraumatic growth inventory. *Anxiety Stress Coping* 2010;**23**(2):127–137.
32. Radloff LS. The CES-D Scale. *Appl Psychol Meas* 1977;**1**(3):385–401.
33. Kann L, Kinchen S, Shanklin SL, *et al*. Youth risk behavior surveillance—United States, 2013. *Morb Mortal Wkly Rep* 2014;**63**(supplement 4):1–168.
34. US Department of Health and Human Services S.a.a.m.h.s.a. Results from the 2013 National Survey on Drug Use and Health: Summary of National Findings, 2014.
35. Emmons KM, Puleo E, Sprunck-Harrild K, *et al*. Partnership for Health-2, a web-based versus print smoking cessation intervention for childhood and young adult cancer survivors: randomized comparative effectiveness study. *J Med Internet Res* 2013;**15**(11):e218.