

CCSS Analysis Concept Proposal January 24, 2008

1. **Title:** Prevalence and Clustering of Multiple Behavioral Risk Factors in Adult Survivors of Childhood Cancer: Implications for Prevention

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3. **Background & Rationale**

Modifiable behavioral risk factors are leading causes of morbidity and mortality among the general US population (Mokdad et al 2005). The leading causes of preventable death in the US in 2000 were due to tobacco use, unhealthy diet, physical inactivity and alcohol abuse. These health behaviors are modifiable, giving researchers and public health professionals significant opportunity for prevention activities that may reduce premature death and chronic diseases, such as different types of cancer, type-2 diabetes and cardiovascular disease (e.g., McGinnis and Foege, 1994; Hu et al., 2001; Mokdad et al., 2004; Danaei G et al., 2005). Multiple risk factor patterns indicate that these health behaviors do not occur at random, often clustering within individuals in specific combinations (IOM, 2001). In a recent analysis of the 2001 National Health Interview Survey, only 7% of the US population reported no risk factors when asked about cigarette smoking, risky alcohol consumption, physical inactivity and overweight (Fine et al., 2004). The most common health risk behavior was low physical activity (76.9%), followed by overweight (58%), smoking (22.8%) and risky drinking (11%). Fine et al, 2004 found that health risk factors often co-occurred in the population. Within this population, 33% had one risk factor, 45% had two risk factors, 12% had three risk factors and 2% of the population had four risk factors (Fine et al., 2004). Risk factors were greatest among men younger than age 65 years, individuals who did not graduate from high school, and those with the highest levels of mental distress (Fine et al., 2004). Among British adults, multiple risk factors were more prevalent among men, lower social class households, singles, and non-working individuals, but less prevalent in older adults and homeowners (Poortinga 2007).

Among childhood cancer survivors, the prevalence of each individual health risk behavior is comparable or lower than the general population and controls (see Clarke and Fisher, 2007 for a systematic review). However, engaging in health risk behaviors by cancer survivors is particularly problematic, as poor outcomes associated with treatment exposures may be exacerbated by health behaviors that increase underlying risk of disease. Prevalence rates of individual health risk behaviors have been reported (Mulhern et al., 1995; Tyc et al., 2001; Larcombe et al., 2002); however there have been few reports of the manner in which they co-occur. We know of only one study that has reported behavioral patterning in childhood survivors. Butterfield et al (2004) reported that among an identified group of 541 childhood cancer survivors who smoked, 63% engaged in 2-3 additional risk behaviors and 6% engaged in 4-5.

Previous CCSS studies have reported the prevalence of single risk behaviors, primarily smoking (Emmons et al, 2002; Emmons et al., 2003). One study has reported multiple health risk behaviors, but this was among a selected group of smokers recruited from CCSS (Butterfield et al., 2004). To date, patterning of multiple health risk behaviors in the entire CCSS has not been reported.

Describing the pattern of multiple health behaviors among childhood cancer survivors is important because of the possible synergistic effects of risky behavior on health outcomes. Understanding these behavioral clusters and associated demographic covariates can provide support for existing screening guidelines, planning for future prevention programs, and the opportunity to design multiple lifestyle intervention approaches to modify late-effects. It is possible that multiple-behavioral interventions will have a greater impact on health than a more traditional one-behavior-at-a-time approach.

4. Specific Aims

The aims of this analysis are:

Aim 1: To describe the prevalence of individual health risk behaviors among the CCSS cohort compared to the US population and to CCSS sibling controls.

Aim 2: To describe the type and prevalence of clusters of health risk behaviors (i.e., combinations of physical inactivity, risky drinking, smoking and overweight (as an indicator of poor dietary quality and eating patterns) in the CCSS cohort and determine if they are similar to those of siblings and US population.

Aim 3: To identify associations between behavioral risk factor clusters and characteristics related to cancer and treatment as well as personal demographics and psychosocial distress.

5. Methods

A. Sample

Survivors/Siblings \geq 18 years of age who were alive and who independently completed the baseline questionnaire will be included.

B. Primary Measures

Smoking: Questions N1, N1d, N1b.

- Smoker = smoked \geq 100 cigarettes in lifetime and current smoking
- Nonsmoker = smoked < 100 lifetime cigarettes or former smoker

Alcohol: Questions N6-N8

- Men Risky Drinking = alcohol > 2 drinks per day
- Men Not Risky Drinking = alcohol \leq 2 drinks per day
- Women Risky Drinking = alcohol > 1 drinks per day
- Women Not Risky Drinking = alcohol \leq 1 drinks per day

Physical Activity: N9

- Inactive = active < 3 days
- Active = active \geq 3 days

Overweight: (Height and weight from section A of the baseline survey)

- Healthy Weight = BMI < 25 kg/m²
- Unhealthy Weight = BMI \geq 25 kg/m²

C. Covariates

Demographics

Gender

Age at survey (Continuous age in years and grouped as 18-29, 30-39, 40-49, 50+)

Race/Ethnicity (Non-Hispanic White, Non-Hispanic Black, Hispanic, Asian/Pacific Islander, Other)

Education (Did not graduate from high school, High school graduate, College graduate)

Annual household income

Marital status

Health Insurance (No insurance; Private (i.e., place of employment, spouse/parent, or self-pay); or Public (i.e., Military or Medicaid))

Cancer History

Age at cancer diagnosis (Date of diagnosis – date of birth)

Examined both as a continuous (years) and as a grouped variable (< 5 years, 5-9 years, 10-14 years, 15-20 years)

Cancer diagnosis

Cancer treatment

Chemotherapy

None

Anthracyclines

Alkylating agents

Both of the above

Other chemo

Radiation

Cranial

Chest

Radiation other than cranial or chest

No radiation

Surgery

Surgery amputation – lower limb
Surgery other
Surgery no

Psychosocial & Health Status

Physical Functioning: Personal Care (N10) and Routine Needs (N11)

2=Yes, personal care needs (N10=Yes and N11=No or N11=Yes)

1=Yes, to Routine Needs (N10=No and N11=Yes)

0=Neither (N10=No and N11=No)

Depression = Brief Symptom Inventory depression subscale

Examined both as a continuous variable and categorically for signal detection methods (Cutoff (T=63)

D. Analyses

Aim 1: Descriptive statistics reporting the prevalence and 95% confidence interval of each individual health risk behavior will be calculated. These prevalence estimates will be compared between siblings and survivors and to US population estimates from the 2001 National Health Interview Survey (Fine et al. 2004). Differences in prevalence proportions will be compared between siblings and survivors in using generalized estimating equations, adjusting for at least age, gender, and race/ethnicity. Prevalence estimates from the NHIS sample will be standardized to the age, gender and race distribution of the survivor and the sibling samples prior to comparison to the respective groups, and evaluated with two sample z-tests.

Aim 2: A cluster grid of all possible combinations of behaviors will be devised and the prevalence of the frequency of reporting any summative combination of 0, 1, 2, 3, or 4 healthy behaviors will be estimated. Differences in prevalence proportions will be compared between siblings and survivors in using generalized estimating equations, adjusting for at least age, gender, and race/ethnicity. Prevalence estimates from the NHIS sample will be standardized to the age, gender and race distribution of the survivor and the sibling samples prior to comparison to the respective groups, and evaluated with two sample z-tests.

Aim 3: Three levels of the ordinal variable of number of health risk behaviors will be formed as 0 or 1, 2, or 3 or 4. This ordinal dependent variable will be analyzed using first a proportional odds model, using the score test to determine if the logit surface are parallel (the proportional odds model assumption), and then with generalized logit analyses to estimate the effects of various covariates on the odds ratios. Three separate models will be fitted with the following independent variables:

1) diagnosis group, 2) treatment exposures, and 3) sociodemographic, function, and psychological distress variables. Age at diagnosis, gender, race, and age at questionnaire completion will be considered in each model.

E. Analysis plan

We propose to conduct data analyses at St. Jude under the direction of Dr. Kiri Ness. She will supervise work by our data analyst, Sue Huang. All analytic plans and analyses will be reviewed by the CCSS statistical coordinating center.

6. References

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Sarcoma
Bone
Cancer Treatment
Chem 5
Radiation
 Cranial
 Chest
 Radiation other than cranial or chest
 No radiation
Surgery
 Surgery amputation – lower limb
 Surgery other
 Surgery no

1 Comparisons standardized to the age, gender and race distribution of the survivors

2 US population estimates from the 2001 National Health Interview Survey (Fine et al. 2004) standardized to the age, gender, and race/ethnicity distributions

3 Significant differences among survivor, sibling, US norms to be indicated by superscripts

Table 2. Clustering of multiple health risk factors in CCSS

<u>Number of risk factors</u>	<u>Smoker</u>	<u>Overweight</u>	<u>Inactive</u>	<u>Drinker</u>	<u>O%</u>	<u>O/E Sibs¹</u>	<u>O/E Pop²</u>
4	Y	Y	Y	Y			
				Total			
3	Y	Y	Y	X			
3	X	Y	Y	Y			
3	Y	X	Y	Y			
3	Y	Y	X	Y			
				Total			
2	X	Y	Y	X			
2	Y	X	Y	X			
2	Y	Y	X	X			
2	X	X	Y	Y			
2	X	Y	X	Y			
2	Y	X	X	Y			
				Total			
1	X	X	Y	X			
1	X	Y	X	X			
1	Y	X	X	X			
1	X	X	X	Y			
				Total			
0	X	X	X	X			
				Total			

Y, presence of the risk factor; X, absence of risk factor; O=observed prevalence of combination of risk factors; E=expected prevalence of combination of risk factors

^{1,2} Standardized to the age, gender and race distribution of the survivors

Table 3. Multinomial logits for sum of risk factors, odds ratios (95% CI) in CCSS

	<u>3 or 4 vs 0 or 1 risk</u>	<u>2 vs 0 or 1 risk</u>
Intercept		
Gender		
Male		
Female		
Age at Interview (years)		
18-29		
30-39		
40-49		
50+		
Race/ethnicity		
Hispanic		
Non-Hispanic black		
Asian/Pacific Islander		
Non-Hispanic other		
Non-Hispanic white		
Education		
< High school graduate		
High School Graduate		
Some college		
Bachelor's		
Health Insurance		
No insurance		
Private		
Public (e.g., Military, Medicare, or Medicaid)		
Mental distress		
Depressed		
Not depressed		
Physical Functioning		
Impairments		
No impairments		
Age at Cancer Diagnosis, yrs		
Mean age		
Cancer Diagnosis		
Leukemia		
CNS		
Hodgkin's		
NHL		
Wilms'		
Neuroblastoma		
Sarcoma		
Bone		
Cancer Treatment		
Surgery		
None		
Lower limb amputation		
Any other		
Radiation		
None		
Brain		

Chest
Any other
Chemotherapy
None
Anthracyclines
Alkylating agents
Both of the above
Other chemo