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Survivor Profiles Predict Health Behavior Intent: The Childhood Cancer Survivor Study

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Abstract

Objectives—To determine whether unique groups of adult childhood cancer survivors could be defined on the basis of modifiable cognitive, affective and motivation indicators. Secondary objectives were to examine to what extent group membership covaried with more static variables (e.g., demographics, disease, and treatment) and predicted intent for subsequent medical follow-up.

Methods—Using latent class analysis of data from 978 participants (ages 18–52 years; mean, 31; SD, 8) in the Childhood Cancer Survivor Study, we classified survivors according to their worries about health, perceived need for follow-up care, health motivation, and background variables. Intent to participate in medical follow-up, as a function of class membership, was tested using equality of proportions.

Results—The best-fitting model (BIC=18,540.67, BLMRT=<0.001) was characterized by three distinctive survivor classes (worried, 19%; self-controlling, 26%; collaborative, 55%) and three significant class covariates (gender, perceptions of health and severity of late effects). A smaller proportion of survivors in the *self-controlling* group [81%] than in the *worried* [90%] ($P=0.015$) and *collaborative* [88%] ($P=0.015$) groups intended to obtain a routine medical checkup. A smaller proportion of survivors in the *self-controlling* group [32%] than in the *collaborative* [65%] ($P=<0.001$) and *worried* [86%] ($P=<0.001$) groups planned a cancer-related check-up. A smaller proportion of survivors in the *collaborative* group [65%] than in the *worried* group [86%] ($P=<0.001$) were likely to obtain a cancer-related check-up.

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Conclusions—Childhood cancer survivors can be classified according to modifiable indicators. The classification is distinctive, predicts intent for future medical follow-up, and can inform tailored interventions.

Keywords

childhood cancer; survivorship; late effects; medical follow-up; pediatric oncology

INTRODUCTION

As childhood cancer survival rates approach 80%–90%,^[1, 2] interventions to modify late treatment-related morbidities^[3–6] become increasingly important. Despite clear treatment exposure-based follow-up recommendations,^[7] survivors' participation in recommended cancer-related follow-up is sub-optimal.^[8–14]

There is growing support for intervention strategies that target what people think, rather than what they do, to promote health-enhancing behaviors.^[15] Motivation, perceived self worth, social/behavioral contexts, and worries/concerns are observable variables that may influence health outcomes as *mediators* (affecting why and how interventions work) and as *moderators* (affecting the impact of interventions on different people and under different circumstances).^[15–17] Not only can these variables be experimentally manipulated^[17] and targeted for intervention, but they also may be useful in defining groups that respond better to one model of survivorship care versus another. We therefore used latent class analysis (LCA) to: 1) characterize survivor groups on the basis of potentially modifiable indicators; 2) identify background variables likely to predict group membership; and 3) determine whether group designation predicts intent to participate in medical follow-up.

BACKGROUND

Late effects are cancer-related sequelae that persist or develop five or more years after completion of cancer therapy. They encompass numerous conditions, including organ dysfunction, psychosocial problems, and subsequent malignancies, that reduce survivors' quality of life and predispose them to early mortality.^[18] Investigators from the Childhood Cancer Survivor Study (CCSS) reported a 73% cumulative incidence of chronic health conditions and a 42% cumulative incidence of severe, disabling, or life-threatening conditions or death from chronic illness among survivors 30 years after cancer diagnosis.^[18] Childhood cancer survivors' long-term health outcomes are optimal when they receive ongoing comprehensive follow-up care that includes monitoring for and treating the late effects of their cancer therapies.^[19] The Children's Oncology Group (COG) has compiled risk-based, exposure-related clinical practice guidelines for screening and management of late effects of treatment for pediatric malignancies.^[7] However, CCSS data indicate that most survivors are not engaging in the recommended follow-up care.^[8, 11–12]

A variety of demographic, medical, and logistic factors are barriers to adequate follow-up care for survivors of childhood cancer. At the time when most children and adolescents are considered cured of their cancer, they generally have no overt sequelae of chemotherapy, surgery, or radiation.^[20] Most survivors are gradually lost to follow-up at their treating institutions.^[20–22] Further, most adult survivors of childhood cancer do not have a summary of their cancer and therapy, can describe their treatment only in broad terms, and are unaware of their risk of sequelae.^[20, 23]

The risk and the severity of late effects are potentially modifiable by interventions that encourage survivor participation in specialized surveillance, screening, and risk

management.^[24] However, only 19% of 9434 adult survivors reported having had a cancer center evaluation within the preceding 2 years; 42% reported having had a cancer-related medical evaluation by a community or cancer center physician during that interval.^[21] A recent study^[11] documented that while 88% of 8,522 childhood cancer survivors had received some form of medical care during the preceding 2 years, only 32% had received survivor-focused care and only 18% reported survivor-focused care that included advice about screening for and reduction of late-effects risks. Many survivors who do not receive follow-up care report that their primary physician sees no need for specialized follow-up; others perceive themselves to be in good health and not in need of cancer-related care.^[25]

To integrate the multiple factors that influence survivor behavior, we selected the Interaction Model of Client Health Behavior (IMCHB)^[26–30] (Figure 1). This model recognizes background variables, including demographics, environmental resources (e.g., income, health care access), social influences (e.g., social support, subjective norms), and physical limitations (e.g., pain, functional limitations), as influential moderators or direct predictors of health behavior outcomes. Dynamic variables, such as cognitive appraisal (e.g., health beliefs, knowledge), motivation, and affective response (e.g., fear, anxiety) are identified as important covariates, direct predictors, or mediators of these outcomes. Briefly, the model comprises three elements: client singularity (the unique intrapersonal and contextual configuration of the individual), client-professional interaction, and health outcomes. The model's working hypothesis is that the potential for positive health outcomes increases as the intervention is tailored to the uniqueness (singularity) of each individual (i.e., background, affective, cognitive, and motivation characteristics). The background variables are considered to be more static and to potentially moderate the influence of the more modifiable dynamic mediating variables – affective response, cognitive appraisal, and motivation. The model has been used successfully to identify predictors, moderators, and mediators of breast self-examination^[31] physical activity,^[32–33] mammography,^[34] bone densitometry, and echocardiography screening^[35] in childhood cancer survivors.

We used the **modifiable constructs** within the IMCHB to generate a latent class (LC) model of childhood cancer survivors. The primary objective was to determine whether unique groups of childhood cancer survivors could be defined on the basis of their members' configuration on known robust mediators (cognitive appraisal, affective response, motivation) of health behavior. Secondary objectives were to examine to what extent group membership covaried with more static **moderating** variables (e.g., demographics, disease, and treatment) and predicted subsequent medical follow-up outcomes.

METHODS

Data Source

The CCSS is a multi-institutional retrospective cohort study initiated in 1994 to examine late effects in survivors of pediatric cancers diagnosed and treated between 1970 and 1986. Survivors completed a baseline questionnaire at study entry and respond to follow-up questionnaires at regular intervals. Participants consented to release their medical records. Questionnaires and sampling methods were detailed by Robison et al.^[36] and are available for review at <http://www.stjude.org/ccss>. The CCSS has IRB approval from each of the 27 participating institutions.

Sample

The 20,346 survivors initially invited to participate in CCSS were those who had survived 5 or more years after treatment for a malignant disease diagnosed (before age 21 years). In an ancillary study, the Health Care Needs Survey (HCNS), 1600 of the survivors were

randomly sampled; 978 (61%) completed and returned the survey. Non-respondents to the HCNS were predominantly male (59%), in a racial/ethnic minority group (37%), or did not complete high school (56%). Self-reported data from everyone who responded to the HCNS and Follow-up 2002–2003 surveys were used in the present study. All survivors in this study were age 18 years at the time of data collection.

Measures

Class indicators (fears, health concerns, intrinsic and extrinsic motivation): All of the items comprising the measures of interest within the survey data were subjected to both exploratory and confirmatory factor analyses. Only those items that were significant in these preliminary analyses were used in the latent class analysis. Affective response: Three summed items defined survivors' worries/fears about: future health, recurrence of cancer, and discovery of a problem at a check-up visit (1=not at all; 5=extremely). **Cognitive appraisal:** Three items were summed to define survivors' concerns about: general health, the risk of getting sick or developing problems related to previous cancer, the importance of a check-up (1=not at all; 5=extremely). **Intrinsic motivation:** Five summed items from the Multidimensional Health Locus of Control Scale^[37] (Abbreviated as: In control of my health; My behavior determines my health; What I myself do is most important; I can avoid illness by self-care; ; My right actions keep me healthy) (1=moderately/strongly disagree; 4=moderately/strongly agree). **Extrinsic motivation:** Four summed items from the Multidimensional Health Locus of Control Scale^[37] (Abbreviated as: Providers control my health; Must have regular doctor visits to stay well; If unwell, should consult a provider; I can only do what doctor tells me) (1=moderately/strongly disagree; 4=moderately/strongly agree).

Covariates—Demographic, disease, and treatment variables included: age at follow-up, age at cancer diagnosis, years since cancer diagnosis, gender, education, race, personal income, and current health insurance status. **Perceived severity of late effects:** Survivors indicated whether they had experienced chronic health problems lasting longer than six months and rated the severity of their main chronic health problem (1=mild – no medications, no effect on daily life; 4=life threatening). These responses were dichotomized to create a “late effects” variable (moderate, severe or life-threatening vs. mild or no chronic problems). **Health status:** Survivors rated their current health with a single-item measure as 1=Excellent to 5=Poor.

Medical Follow-up—Routine medical check-up: Survivors indicated their likelihood of having a routine check-up during the next 2 years (0=very unlikely or unlikely; 1=possible, likely, or very likely). **Cancer-related check-up:** Survivors indicated their likelihood of having a medical exam within the next 2 years to check for health problems caused by cancer treatment (0=very unlikely or unlikely; 1=possible, likely, or very likely).

Statistical Analysis

We used SAS 9.1 software (SAS Institute Inc, Cary, NC) to describe sample characteristics and MPlus Version 6.0 software (Muthén & Muthén, Los Angeles, CA) to develop the latent class models. We used survivors' responses to continuous indicators that represented the **mediators** from the theoretical model (affective response, cognitive appraisal, intrinsic and extrinsic motivation) to estimate latent class membership for each participant.^[38]

As recommended by Nylund and colleagues^[39] we used a combination of the Bayesian information criterion (BIC) and bootstrapped Lo-Mendell-Rubin parametric likelihood ratio test (BLMRT) to determine the number of latent classes. During the model-fitting process, classes are added to the model as long as the BIC continues to decrease and the added

classes are substantively meaningful. The BIC balances model fit with model parsimony such that lower values represent better fit. The BLMRT compares progressive iterations of the more parsimonious models (k-1 classes) against models with a greater number of classes (k classes). Models that have the fewest distinctive classes that are substantively meaningful and a BLMRT $P = 0.05$ are accepted.

As part of the model-fitting process, covariates were added to further characterize the latent classes. Significant covariates with the latent classes ($P < .05$) were included in the best-fitting latent class model. Finally, binary outcomes (routine medical or cancer-related follow-up) were added to the model to determine class-specific likelihood of participation in follow-up care.

RESULTS

Descriptive Summary of the Sample

Respondents ranged in age from 18 to 52 years (median, 30 years) (Table 1). Slightly more than half (53%) were female and 73% were white. Less than half (43%) were college-educated, and 67% reported personal incomes less than \$40,000 per year.

Latent Class Models

We first identified survivor classes on the basis of our indicator variables without including covariates (Table 2). The 4-class and 5-class models had lower BIC values than the 3-class model, but the BLMRT for the 4- and 5- class models was not significant. The 3-class model was superior to the 2-class model on the basis of BIC (18,914.79) and BLMRT ($P = 0.001$).

To ensure that the 3-class model's superior fit was not based on a small set of random start values, we repeated the analyses with 100 random start values and 10 optimizations for each of the 100 sets of start values; all 100 random start values resulted in the same solution, confirming that the 3-class model offered the best fit.

Our final step was to assess the substantive meaning of the 3-class model. Compared to the other classes, members of the smallest class (19%) reported poorer perceived health status, a higher percentage of moderate to life-threatening chronic illnesses, the greatest worries/fears and health concerns, and the lowest levels of intrinsic motivation in managing their health. Given the young age of the total sample, we would expect the group with the most health problems to be the smallest class. In the next largest class (26%), all class indicators were markedly opposite to those of the smallest class, and health was reported as good to excellent. Having two groups at these extremes on the class indicators and self-reported health variables would logically predict a more moderate class; indeed, the largest class (55%) showed intermediate scores on the class indicators and on self-reported health status. When covariates were included, a model that included sex, perceived health status, and perceived severity of late effects further reduced the 3-class BIC to 18,540.67 (BLMRT $P < 0.001$). For the final model with covariates, the average posterior probabilities (showing how well each participant fit the assigned class) ranged from 86% to 88%, indicating a high degree of confidence in class assignment and model fit.

Affective, Cognitive, and Motivation Profiles of the Three Classes

Figure 2 and Table 3 show the class-specific means for the indicator variables (affective, cognitive and intrinsic/extrinsic motivation scales). We labeled the classes on the basis of survivors' responses to the class indicators (dynamic mediating variables): 1) *Worried survivors* (19% of the total) were the most worried about their health and endorsed the importance of routine check-ups most strongly. They were the least intrinsically and most

extrinsically motivated to manage their health care. This group was predominantly female with the greatest percentage of black and Hispanic survivors, the fewest college graduates, and the greatest percentage of lower-income survivors and survivors with one or more chronic health problems (Table 1). 2) *Self-controlling survivors* (26%) were not greatly concerned about their cancer history and risk of sequelae, and they saw little value in medical check-ups. They were the least likely of the groups to report having read about childhood cancer or related topics. The *self-controlling* group reported the least worry or anxiety about their cancer and treatment and showed the least extrinsic motivation about their health. The group was predominantly male, with the lowest percentages of black and Hispanic survivors and the highest percentages of survivors who had completed college and who reported higher incomes. Most members of this group reported no late effects (84%); they also reported the least limitation of physical activity, and 95% reported their health as good to excellent. 3) *Collaborative survivors* (55%) were the most moderate in terms of their worries/fears and concerns about their health. While members of this group were highly intrinsically motivated to manage their health care, they showed significantly greater extrinsic motivation than the self-controlling group. Table 3 lists the estimated conditional probability of the groups' mean scores on the indicator scales. The estimated conditional probability divided by the standard error (EST/SE) indicates the strength of the relationship between the indicator and the latent class variable.

Survivor Participation in Medical Follow-up Care

We next compared the self-reported likelihood of a future routine or cancer-related medical check-up in the three groups. Controlling for the significant latent class covariates (sex, perceived health status, and perceived severity of late effects), we determined how well the model distinguished survivors who were likely to participate in follow-up care by testing the equality of the proportions of survivors likely to participate in routine or cancer-related medical follow-up across classes (Table 4). The greatest proportions of those likely to obtain a routine medical checkup or cancer-related check-up within the next 2 years were observed in the worried and collaborative groups, followed by the self-controlling group. A smaller proportion of the collaborative group than of the worried group was likely to obtain a cancer-related check-up. A similar proportion of survivors (90% vs. 88%) in the worried and collaborative groups were likely to obtain a routine medical check-up within the next 2 years.

DISCUSSION

Three distinct groups of childhood cancer survivors (*worried*, *self-controlling*, and *collaborative*) were identified through latent class analysis on the basis of survivors' self-reported feelings and perceptions about their cancer and its treatment, their future health, and their motivation related to health. Sex, perceived health status, and the reported presence and severity of late effects were significant covariates of the classes, and class membership predicted the likelihood of participating in the recommended routine and/or cancer-related medical care. Latent class analysis supported the basic premises of the conceptual model^[26]. Survivors could be profiled by the model's modifiable mediators; these heterogeneous profiles together with the model's background variables (moderators) predicted self-reported behaviorally-related outcomes.

Survivors in the *self-controlling* group perceived themselves to be in good health and as a result, they likely see no need for routine medical or cancer-related care.^[25] This attitude may, however, reflect unawareness of their long-term risks of sequelae.^[23] Given these survivors' strong intrinsic motivation for health, they may benefit from distance-based and autonomy-supportive intervention strategies delivered by experts in survivor care at major

cancer treatment centers; such interventions could include print media and/or telephone interaction addressing the risks of late sequelae and recommending screening/follow-up. Because these survivors are the least worried about their future health, the information provided should be detailed and graphic in explaining the probability and nature of risks, given their treatment exposures. Increasing the affective response of survivors in this group may be a successful strategy to enhance their overall concern and interest in follow-up care.^[9, 40]

The *worried* group was the class least likely to have easy access to risk-based health care, given their demographic and resources profile. A recent study^[11] found that survivors who were African-American, older at interview, or uninsured were less likely to have received risk-based, survivor-focused care. Identifying these survivors through established long-term survivor cohorts (CCSS, British Childhood Cancer Survivor Study, and Childhood Cancer Research Network,^[41]) treating institutions, and community solicitation (web or other media) and providing them with both distance-based (mail and/or telephone) and local care resources may facilitate their participation in medical follow-up care.

The *worried* group was also distinguished by cancer-related fears and anxieties. These fears, together with the group's perceptions of poorer health and of a greater threat posed by chronic illness, may deter participation in screening/follow-up. Fear, worry, and anxiety exert both positive and negative influences on health-related behaviors^[9, 42] and can support or inhibit motivation toward health-promoting behavior. Although early detection through screening may positively modify a disease course, the prospect of learning that one has a serious health condition can be profoundly frightening.^[42–43] Survivors may either resort to avoidance behavior (e.g., not going for routine evaluations) or adhere to follow-up recommendations to reduce the discomfort caused by fear and anxiety.^[40, 42] Misconceptions and lack of specific information about risk and risk factors can exacerbate fear or contribute to denial of the possibility of significant health problems.^[40, 42, 43] Survivors in the *worried* class would likely be receptive to individualized print summaries detailing their long-term risks and ways to reduce those risks. To avoid further escalating fears and concerns, the tone of the information offered should be non-threatening.

Survivors in the *collaborative* group were both receptive to professional intervention and highly motivated to assume a primary role in maintaining their health. They are likely to work effectively with their providers if they are made aware of their risks and the actions necessary to reduce those risks. Like many survivors, however, they may not fully understand their risks or realize that specific follow-up care is recommended to modify the risks. Previous studies have found substantial knowledge deficits and misperceptions among childhood cancer survivors about their cancer diagnosis, treatment, and cancer-related health risks.^[44–51] Although information about late effects is increasingly being provided by family and oncology clinicians, persistent knowledge deficits may limit adult survivors' participation in screening and other risk-reducing interventions.^[51] *Collaborators* may be highly motivated to follow through on screening recommendations if they are: 1) provided with treatment summaries detailing their specific risks; 2) given specific recommendations for screening and follow-up; and 3) made aware of community resources for care. Cancer treatment centers can provide survivors and their providers with print summaries of individual risks and recommended follow-up at the end of therapy and periodically afterward (as reminders to seek follow-up care).

Tiered or staged follow-up approaches for childhood cancer survivors have recently been proposed.^[52–53] Levels of care range from providing the survivor with individualized print materials detailing treatment and recommended follow-up screening, to offering telephone consultation and support for specific risks, to care at specialized late effects clinics. These

models have been based largely on survivors' diagnoses and treatment exposures. Other models of care are provider-based, with providers ranging from nurse specialists to a primary care physician and a panel of sub-specialists.^[54] We offer yet another option to enhance emerging models of survivorship care – using survivor profiles as well as cancer treatment history and level of provider to inform tailored follow-up care.

Limitations

The study sample reflects a subset of the overall CCSS population, that is, those who responded to the HCNS; therefore, survivors included in the present analysis may not be fully representative of the population from which they were derived. While the CCSS population represents a large and heterogeneous cohort of 5-year survivors, results may not be generalizable to all survivors of childhood cancer. Because the approach for determining the optimal number of classes in latent class analysis is less standardized than with other analytic strategies, it is possible that childhood cancer survivors comprise more than the three classes we identified. The BLMRT, however, did not support more classes. While we included a large number of covariates in the analysis, there may be additional variables that differ across classes but were not available in our data set.

Conclusions

We identified three distinct profiles of childhood cancer survivors on the basis of responses to affective, cognitive, and motivation items related to their disease and treatment. Significant class covariates included sex, self-reported health status, and the self-reported presence/severity of late effects. These profiles predicted whether survivors were likely to obtain routine medical check-ups and/or participate in cancer-related medical follow-up. Collectively, our findings suggest that behavior related to modification of late-effects risks is predicted by a constellation of factors that are uniquely configured in discrete subgroups of survivors. The findings further suggest that a “one size fits all” approach is not likely to be the optimal strategy for models of survivorship care. Items useful in profiling survivors' likely behavior patterns and their specific knowledge about treatment and long-term follow-up recommendations could be used for brief screening at the end of treatment and periodically throughout survivorship to identify those at risk and inform tailored intervention strategies. Current and future studies are focused on the utility of the class profiles in predicting actual participation in medical surveillance and behaviorally-related health outcomes.

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Figure 1.
The Interaction Model of Client Health Behavior

Figure 2.
Estimated mean scores on the indicators by latent class

Table 1

Background variables by group classification (N=978)

	Total Sample Mean (SD) (n=978)	Worried (n=180)	Self-Controlling (n=255)	Collaborative (n=543)	p ^a Value
Demographics					
Age at survey completion					
Mean (SD)	30.7 (7.5)	30.5 (7.4)	30.6 (7.4)	30.8 (7.5)	0.938
Gender					<.001
Female	53%	66%	38%	55%	
Male	47%	34%	62%	45%	
Race/Ethnicity					<.001
White	73%	65%	80%	73%	
Black	8%	14%	5%	7%	
Hispanic	12%	17%	6%	14%	
Other	7%	4%	9%	6%	
Annual Personal Income					0.001
< \$40,000	67%	77%	60%	66%	
>\$40,000	26%	17%	32%	27%	
Not reported	7%	6%	8%	7%	
Education					0.041
Less than HS	7%	7%	7%	7%	
Completed HS	48%	57%	42%	49%	
Completed College	43%	34%	48%	44%	
Not reported	2%	2%	3%	1%	
Previous/Current Health					
Chemotherapy					0.612
Yes	77%	75%	76%	78%	
No	15%	12%	16%	16%	

	Total Sample Mean (SD) (n=978)	Worried (n=180)	Self-Controlling (n=255)	Collaborative (n=543)	P ^d Value
Not reported	8%	13%	8%	6%	
Radiation					0.024
Yes	62%	62%	56%	65%	
No	29%	22%	35%	28%	
Not reported	9%	16%	9%	7%	
Chemotherapy and radiation					0.107
Yes	51%	51%	46%	54%	
No	40%	33%	45%	39%	
Not reported	9%	16%	9%	7%	
Age at cancer diagnosis					0.853
Mean (SD)	9.1(5.9)	8.9(5.9)	9.1(5.7)	9.2(5.9)	
Years since cancer diagnosis					0.973
Mean (SD)	21.6 (4.5)	21.6 (4.4)	21.5 (4.4)	21.6 (4.5)	
Cancer type					0.263
Leukemia	34%	34%	33%	35%	
Central nervous system	9%	7%	11%	9%	
Hodgkin lymphoma	16%	22%	11%	17%	
Non-Hodgkin lymphoma	10%	11%	11%	10%	
Wilms tumor	8%	8%	8%	9%	
Neuroblastoma	4%	3%	5%	4%	
Soft tissue sarcoma	9%	7%	12%	7%	
Bone cancer	9%	9%	9%	9%	
Chronic health problems related to cancer					<.001
Yes	27%	44%	16%	27%	
No	72%	54%	84%	73%	
Not reported	1%	1%	0%	1%	
Late effects					<.001

	Total Sample Mean (SD) (n=978)	Worried (n=180)	Self-Controlling (n=255)	Collaborative (n=543)	P ^d Value
Moderate, Severe, Life-threatening	20%	38%	8%	19%	
Mild or Non-chronic problems	79%	60%	92%	80%	
Not reported	1%	2%	0%	1%	
Self-rated health					<.001
Excellent/Very good/Good	85%	63%	95%	87%	
Fair/Poor	14%	36%	4%	12%	
Not reported	1%	2%	1%	1%	
Limited ability to participate in vigorous activity					0.001
Yes	29%	34%	20%	32%	
No	70%	63%	79%	68%	
Not reported	1%	2%	1%	1%	
Environmental Resources					
Have read about long-term health problems related to childhood cancer within past 2 years					<.001
Yes	36%	46%	20%	40%	
No	64%	54%	80%	60%	
Current health insurance status					0.197
Yes	86%	82%	84%	88%	
No	13%	16%	15%	11%	
Not reported	1%	2%	1%	1%	
Social Influences					
Parents worry about your health					<.001
Almost always or Very often	55%	78%	37%	56%	
Sometimes/Not very Often/Never	44%	21%	63%	44%	
Not reported	1%	1%	0%	1%	
Friends/family tell you to be grateful that cancer is cured					<.001
Almost always or Very often	34%	50%	26%	32%	

	Total Sample Mean (SD) (n=978)	Worried (n=180)	Self-Controlling (n=255)	Collaborative (n=543)	p ^a Value
Sometimes/Not very Often/Never	66%	49%	73%	67%	
Not reported	1%	1%	0%	1%	

HS, high school; NA, not applicable

^aComparisons used Chi-square, Fisher's Exact, or ANOVA appropriate to level of measurement

Table 2

Fit statistics of the latent class models

No. of Classes	Log-Likelihood	BIC	Bootstrapped P Value from BLMRT for K-1 Classes
1	−9656.40	19367.89	
2	−9465.85	19021.22	P <.001
3	−9395.43	18914.79	P=0.0050
4	−9361.58	18881.41	P=0.0752
5	−9323.99	18840.78	P=0.1039

Abbreviations: BIC, Bayesian information criterion; BLMRT, bootstrapped Lo-Mendell likelihood ratio test.

Table 3

Latent class indicators by group (N=978)

	Mean Estimate (95% CI)	Standard Error	EST./S.E.	P
<i>AFFECTIVE RESPONSE</i>				
WORRIED (19%)	10.85 (9.45–12.21)	0.697	15.57	<0.001
SELF-CONTROLLING (26%)	5.09 (4.72–5.46)	0.187	27.16	<0.001
COLLABORATIVE (55%)	7.57 (7.21–7.94)	0.187	40.39	<0.001
<i>COGNITIVE APPRAISAL</i>				
WORRIED (19%)	13.29 (12.96–13.63)	0.174	76.29	<0.001
SELF-CONTROLLING (26%)	6.27 (5.69–6.85)	0.296	21.21	<0.001
COLLABORATIVE (55%)	9.90 (9.30–10.50)	0.308	32.11	<0.001
<i>EXTRINSIC MOTIVATION</i>				
WORRIED (19%)	9.99 (9.39–10.60)	0.309	32.37	<0.001
SELF-CONTROLLING (26%)	6.56 (6.20–6.92)	0.183	35.94	<0.001
COLLABORATIVE (55%)	8.47 (8.03–8.92)	0.229	37.06	<0.001
<i>INTRINSIC MOTIVATION</i>				
WORRIED (19%)	15.61 (14.87–16.35)	0.379	41.17	<0.001
SELF-CONTROLLING (26%)	17.04 (16.61–17.48)	0.221	77.25	<0.001
COLLABORATIVE (55%)	16.76 (16.42–17.11)	0.176	95.34	<0.001

EST/SE, estimated conditional probability of mean score divided by the standard error; CI, confidence interval

Table 4

Comparison of the proportion of survivors planning to obtain a routine or cancer-related check-up by latent class

	Worried vs. Self-Controlling	Collaborative vs. Self-Controlling	Worried vs. Collaborative
Variable	% (p value)	% (p value)	% (p value)
<i>Will obtain routine medical check-up in the next 2 years (BIC=19,297.358, BLMRT=<0.0001)</i>	90% vs. 81% (P=0.015)	88% vs. 81% (P=0.015)	90% vs. 88% (P=0.71)
<i>Will obtain cancer-related check-up in the next 2 years (BIC=19,655.458 BLMRT=<0.0001)</i>	86% vs. 32% (P<.001)	65% vs. 32% (P<.001)	86% vs. 65% (P<0.001)

Comparison used chi-square equality tests of means across classes with posterior probability-based multiple imputations (2 degrees of freedom for the overall test and 1 for the pair wise tests).