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Obesity, physical activity, and dietary behaviors in an ethnically-diverse sample of cancer survivors with early onset disease

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Abstract

Purpose.—To assess weight status, physical activity, and dietary behaviors in an ethnically diverse sample of breast and colorectal cancer survivors with early onset disease (50 years).

Methods.—Breast and colorectal cancer survivors, diagnosed between 1999-2009 with early stage cancer diagnosed by 50 years of age, were identified through a population-based cancer registry and surveyed. Descriptive and regression analyses were conducted to characterize the sample and identify correlates of lifestyle behaviors.

Findings.—The majority of participants (n = 156) were female (83%), insured (84%), and racial/ ethnic minorities (29% Asian, 24% Latino, 15% African American). Participants' mean age at response was 50 years and mean time since diagnosis was 9 years. Over half of survivors were overweight or obese. Few participants reported engaging in regular physical activity (31%) and adhering to minimum guidelines for fruit and vegetable consumption (32%). A substantial proportion of survivors consumed fast food in the past week (75%) and nearly half (48%) reported daily consumption of sugar-sweetened beverages. Lower income was associated with inadequate fruit and vegetable intake. Fast food and sugar-sweetened beverage consumption was significantly higher among ethnic minority survivors compared to non-Latino whites.

Conclusions.—High prevalence of overweight and suboptimal adherence to recommended nutrition and physical activity behaviors were observed among cancer survivors with early onset disease. Cancer survivors diagnosed at a young age may benefit from targeted interventions to address overweight and suboptimal nutrition and physical activity.

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Keywords

cancer survivor; physical activity; lifestyle behavior; minorities

Introduction

Early detection of cancer and advances in cancer treatment have resulted in cancer survivors living longer following diagnosis.[1] Care of cancer survivors has historically been focused on successful completion of the primary course of treatment and regular clinical surveillance to promote early identification of recurrence and new cancers. However, over the past decade there has been a growing recognition of the need to address the broader needs of cancer survivors.[2] Although cancer recurrence remains a primary concern, cancer survivors are also at risk for other chronic diseases such as diabetes and heart disease that pose an increasingly heavy burden on the U.S. population.[3–6]

Maintaining a healthy weight, eating a healthful diet, and engaging in the recommended level of physical activity are important to reducing risk for chronic disease in the general population.[7,8] Obese individuals have over 7 times greater risk of developing type 2 diabetes[9] and are at substantially increased risk for cardiovascular disease than their normal weight peers.[10] Unhealthful diet and physical inactivity are risk factors for obesity, and may also independently increase risk for metabolic syndrome and chronic disease.[11,12] Among cancer survivors, adoption of a healthy lifestyle may reduce risk for cancer recurrence. Research indicates that weight gain after diagnosis,[13] inadequate physical activity,[14,15] and poor dietary practices such as low vegetable intake[16] are risk factors for breast cancer recurrence. Among colorectal cancer survivors, studies have shown that high body mass index (BMI) at or after diagnosis is associated with cancer recurrence.[17–21] In addition to cancer recurrence, evidence supports the impact of these lifestyle factors on cancer progression, all-cause mortality, breast or colon cancer-specific mortality, and quality of life. [22–27]

A growing number of studies have examined engagement in healthy lifestyle behaviors and weight status among cancer survivors.[28–30] However, most of this research has targeted survivors soon after treatment completion. Fewer studies have focused on long-term survivors, ethnic minority survivors, or survivors diagnosed in early to mid-adulthood. Adherence to recommended lifestyle behaviors may be of particular importance for breast and colorectal cancer survivors diagnosed at an early age. Outcomes for these common cancers have been responsive to health behavior modification in some studies,[16,26,27,31,32] and individuals diagnosed with early stage disease will spend a substantial proportion of their lives as cancer survivors – at risk over a longer period of time for cancer recurrence, development of new cancers, and multiple chronic diseases.

The purpose of this study was to characterize weight status, physical activity level, and key dietary behaviors, guided by national recommendations and prior research,[33–35] in an ethnically-diverse sample of breast and colorectal cancer survivors diagnosed at a young age (50 years). In addition, the study sought to identify factors associated with unhealthy

lifestyle behaviors, which may guide future interventions to reduce risk for chronic disease among cancer survivors.

Methods

Sample

Survivors were eligible for the study if they were diagnosed with early stage (stage I-II) female breast cancer between the ages of 25-45 years or early stage (stage I-II) colorectal cancer between the ages of 18-50 years during 1999-2009 and were alive at the time of recruitment. We targeted survivors diagnosed over this 10 year time period to accrue a sufficient sample size, given the relatively low incidence of breast and colorectal cancer diagnoses before the age of 50. The target population was selected, in part, because the study was funded through a request for applications that encouraged a focus on breast and colorectal cancer survivors diagnosed with early onset disease, given their increased risk for cancer recurrence and secondary cancer diagnoses. Furthermore, cancer survivors diagnosed early in life may benefit more from lifestyle behavior improvements compared to individuals diagnosed with cancer late in life. We obtained contact information for 497 cancer survivors meeting eligibility criteria (106 breast and 50 colorectal cancer survivors) from the Los Angeles County Cancer Surveillance Program (CSP). Based on prior experience, we estimated we would need to contact around 500 survivors to complete surveys with 150-200 survivors.[36–39] We oversampled racial/ethnic minority survivors, specifically Latinos, African Americans, and the four most populous Asian subgroups in Los Angeles (Chinese, Filipino, Korean, Japanese) given the lack of prior research focus on these subgroups. The pool of 497 survivors included 120 non-Latino whites, 120 Latinos, 85 African Americans, 46 Chinese, 43 Filipinos, 46 Koreans, and 37 Japanese, randomly selected from all eligible within each racial/ethnic group.

Recruitment Methods

Study recruitment occurred from July 2012 to May 2013. Prior to initiating contact with the survivors, we mailed a letter to each survivor's physician informing them of the study, our plan to contact the survivor, and instructions to contact the CSP within two weeks if they did not believe the survivor should be contacted. Fewer than 20 physicians responded to our notification letter, indicating that their patient was either too ill or undergoing treatment for recurrence, in which case we did not attempt to contact the survivor. All other survivors were mailed a packet containing an invitation letter, a description of project activities, information about how we received their contact information from the CSP, an information sheet including all elements of informed consent, and instructions on how to complete the study survey. Survivors were given the option of providing their responses by mail, via a web-based survey, or through a telephone interview and were mailed a $20 gift card after survey completion. If a survivor did not respond within two weeks, we attempted to contact the survivor by telephone up to six times. The University of Southern California, University of California Los Angeles, and California's Committee for the Protection of Human Subjects Institutional Review Boards approved the study protocol, which was also approved by the California Cancer Registry.

Survey Translations

Invitation packets sent to Latino, Chinese, and Korean participants included English language documents and a second version of the documents translated into the relevant language. Based on prior research, we anticipated that most non-Latino white, African American, Filipino, and Japanese participants would have high English proficiency[40]; thus, additional translations were not provided. Our translation methodology involved development of an English version followed by simultaneous translation and back-translation into the target language. A committee of at least two bilingual individuals then compared the translated and back-translated documents to ensure comparability across translated documents. This process has been used successfully in multiple prior studies.[41–45] For the English version, the survey was programmed using Qualtrics software for administration on the web (self-administration). Phone interviews (if requested) were offered for those who spoke English, Spanish, Korean, or Chinese.

Description of Data Collection Instrument and Measures

The survey instrument was guided by the Health Behavior Framework,[46] which provides a heuristic for conceptualizing the relationship between a broad set of immutable (e.g., demographics) and mutable (e.g., beliefs, knowledge, self-efficacy) factors that have been shown in the literature to influence a variety of health behaviors including physical activity and healthy nutrition. The Framework suggests that individual-level factors (e.g., knowledge, self-efficacy, health beliefs) act together with health care system-level (e.g., provider behaviors), and community-level factors (e.g., built environment) to impact behavioral intentions and ultimately health behaviors. The present study focused primarily on assessing individual-level factors from the Framework. The 160-item (colorectal) and 165-item (breast) surveys assessed body mass index (BMI), lifestyle behaviors, cancer-related beliefs, and other relevant topics (e.g. family health history, genetic testing, use of preventive health services, and health information preferences).

The primary outcomes of interest for this paper were BMI, physical activity, fruit and vegetable intake, sugar-sweetened beverage consumption, and fast food consumption. Participants were asked to recall lifestyle behaviors within the past 7 days. Respondents reported the number of times they engaged in moderate or strenuous exercise and number of minutes of exercise overall and on active days.[47] Responses were categorized as 0, 1-4, or 5 or more days of moderate/strenuous exercise per week. Fruit and vegetable intake was assessed with one question that asked about number of servings of fruits and vegetables respondents had eaten each day, and responses were similarly categorized as 0, 1-4, and 5 or more servings per week.[48,49] Participants were also asked the number of times they ate fast food meals or snacks,[48] and the number of times per day they consumed sugar-sweetened beverages in the past week[49]; both measures were categorized as 0 or at least one per week. Current BMI was calculated using self-reported height and weight and was categorized into underweight (18.5 kg/m^2), normal (18.5-24.9 kg/m^2), overweight (25.0-29.9 kg/m^2), or obese (30.0 kg/m^2).

Aligned with the Health Behavior Framework, demographic and health history factors measured included self-reported age, gender, race/ethnicity, income, education level,

employment status, marital status, cancer diagnosis, and years since diagnosis. Knowledge of risk factors for cancer recurrence was measured with eight questions assessing whether participants believe certain health behaviors increase, decrease, or do not affect cancer risk. [50] Higher scores (range 0-8) correspond to higher knowledge. Perceived risk for recurrence was measured using two questions assessing the degree to which survivors thought cancer recurrence and development of another cancer was likely.[51] Higher scores (range 0-4) represent greater perceived risk. Self-efficacy to reduce recurrence risk was measured with two questions about the degree to which survivors agreed with statements about their ability to engage in better self-care and prevent cancer recurrence.[52,53] Perceived knowledge about steps one can take to reduce recurrence[54] and worry about recurrence[52] were each measured with a single item. Higher scores (range 0-5) indicate higher knowledge and greater worry.

Data Analysis

Descriptive statistics were used to characterize demographic characteristics, health beliefs, BMI, physical activity, and dietary behaviors. Guided by national recommendations and prior research,[33–35] unhealthy lifestyle behaviors were defined using the following cutoffs: < 150 minutes of aerobic physical activity per week,[35] < 5 servings of fruits and vegetables per day,[33] 1 sugary drink per day,[34] 1 fast food per week.[34] Given the racial/ethnic diversity of the sample, we also report BMI and lifestyle behaviors by race/ethnicity. Bivariate relationships between potential correlates and each outcome measure were assessed using t-tests, chi-square tests, and univariate logistic regression. Multivariate logistic regression analyses were conducted to identify independent correlates of each outcome controlling for other factors. Statistical significance of variables in the bivariate analyses, collinearity, and conceptual importance of correlates informed the selection of variables included in each of the multivariate models.

Covariates entered into the multivariate model included age (10-year decrease), gender (female vs. male), race/ethnicity (racial/ethnic minority vs. non-Latino white), annual household income (< \$50,000 vs. \$50,000), education level (< college vs. college), employment status (full-time vs. other), marital status (other vs. married/living as married), cancer type (breast vs. colorectal), time since diagnosis (two-year increase), perceived health status (good/fair/poor vs. excellent/very good), self-efficacy to reduce recurrence risk (continuous), knowledge of risk factors for cancer recurrence (continuous), perceived risk for recurrence (continuous), and worry about recurrence (continuous). Given small cell sizes for some racial/ethnic groups and the results of descriptive analyses by race/ethnicity, we collapsed race/ethnicity into two categories for predictive analyses (i.e., racial/ethnic minority vs. non-Latino white). Unadjusted and adjusted odds ratios (OR) with 95% confidence intervals (95% CI) are presented. Statistical significance was assessed at the 0.05 level. SAS version 9.3 (SAS Institute, 2010) was used for all analyses.

Results

Outcome of Recruitment

The final sample included 156 survivors (106 breast, 50 colorectal) for an overall yield of 31.4% out of the 497 contacted. The most common reasons for non-participation were the

inability to make contact with a survivor because of invalid contact information, despite efforts to trace the person, due to selection of cases diagnosed up to 12 years prior to contact (32%, 160/497), and patient refusal (30%, 148/497). The most common method of providing data was completion of the mailed survey (90% of respondents), with smaller proportions selecting the web-based survey (6%) or telephone survey (4%). One-fifth (33/156) of the sample opted to complete the mailed survey in a language other than English. Response rates were comparable across age at diagnosis, diagnosis year, and neighborhood socioeconomic status (based on Census tract-level data collected by the CSP). However, non-Latino whites, breast cancer survivors, and female survivors were significantly more likely to participate than racial/ethnic minorities, colorectal cancer survivors, and male survivors.

Sample Characteristics

Table 1 displays sample characteristics. Among all cancer survivors (n = 156), 29% reported their race/ethnicity as non-Latino white, 24% Latino, 15% African American, and 29% Asian. The mean age of participants at time of response was 50 years (SD 5.9), and 83% were female (breast n = 106, colorectal n = 23). The mean age at diagnosis was 41 years (SD = 5.1). Survivors were diagnosed on average 9 years prior to study participation. Most participants (76%) reported their general health status as excellent, very good, or good. Overall, survivors were relatively knowledgeable about risk factors for cancer recurrence (mean 6.6 out of 8) and had relatively low perceived risk for recurrence (mean 1.2 out of 4), high self-efficacy about their ability to reduce their recurrence risk (mean 7.7 out of 10), moderate perceived knowledge about steps they could take to reduce risk (mean 3.8 out of 5), and moderate worry about recurrence (mean 3.2 out of 5).

Self-Reported Body Mass Index, Physical Activity Level, and Dietary Behaviors

Table 2 displays self-reported BMI, physical activity level, and dietary behaviors. Mean BMI for the sample was 26.5 kg/m^2. By BMI category, 44% of participants had a BMI in the normal range, 31% were overweight, and 24% were obese. Latinos had the highest proportion of overweight/obese participants (90%), followed by African Americans (78%), non-Latino whites (48%), and Asians (21%; data not in table).

Self-reported physical activity levels were generally low, with 57% of survivors reporting being active 1-4 days and 22% of survivors reporting no physical activity in the past week. Only 31% of survivors reported engaging in physical activity for 150 or more minutes in the last week, consistent with national recommendations for aerobic physical activity. Rates of adherence to 150 minutes of physical activity per week were lowest among Asians (19%), followed by Latinos (32%), non-Latino whites (39%), and African Americans (41%; data not in table).

Almost all participants (98%) reported consuming at least one serving of fruits and vegetables per day, and average consumption for the sample was 3.8 servings per day (range 0-15). One quarter of survivors did not eat any fast food meals or snacks in the past week, but the 75% that did report doing so consumed fast food 2.8 times per week on average. While 52% of participants reported drinking no sugar-sweetened beverage in the past week,

those who did reported consuming an average of 2.8 drinks each day. Highest mean daily consumption of fruits and vegetables was observed for non-Latino whites (Mean = 4.28; SD = 2.53) and Asians (Mean = 4.07; SD = 2.66), followed by African Americans (Mean = 3.67; SD = 2.48), and Latinos (Mean = 3.41; SD = 2.60; data not in table). Fast food consumption in the past week was highest among African Americans (92%), followed by Latinos (84%), Asians (78%), and non-Latino whites (56%; data not in table). Daily sugar-sweetened beverage consumption was also highest among African Americans (71%), followed by Latinos (59%), Asians (42%), and non-Latino whites (31%; data not in table).

Factors Associated with Physical Activity and Dietary Behaviors

Table 3 presents unadjusted and adjusted odds ratios for engaging in physical activity and dietary behaviors. Bivariate analyses revealed that participants who were in good/fair/poor health, had lower knowledge of risk factors for cancer recurrence, and reported lower self-efficacy to reduce risk were more likely to be non-adherent to physical activity recommendations. In adjusted analyses, these factors were no longer significant.

Lower income was the only factor that predicted a greater likelihood of consuming less than five fruits and vegetable servings per day in bivariate analyses, and this factor remained a marginally significant correlate of fruit and vegetable consumption in multivariate analyses (OR: 2.52, 95% CI: 1.00–6.33).

Factors associated with consumption of at least one fast food meal or snack in the past week included being a racial/ethnic minority, having less than a college education, working full-time, having lower self-efficacy to reduce recurrence, and having higher cancer-related worry about recurrence. All of these factors except education were significant in multivariate analyses. For example, full-time employment was associated with 3.17 times higher odds of consuming fast food compared to non-full time employment (95% CI: 1.25–8.05), controlling for other covariates. Racial/ethnic minority survivors had 5.37 times higher odds of having at least one fast food item per week compared to non-Latino white survivors (95% CI: 2.08–13.86).

In unadjusted analyses, factors associated with consumption of at least one sugar-sweetened beverage per day included being younger, a racial/ethnic minority, not married or living as married, and reporting higher perceived risk for recurrence. Only racial/ethnic minority (OR: 2.65, 95% CI: 1.14–6.13) and marital status (OR: 2.75, 95% CI: 1.28–5.91) were significant in multivariate analyses.

Discussion

Our study sought to evaluate physical inactivity and unhealthy dietary behaviors among a sample of ethnically-diverse, middle-aged cancer survivors, given growing evidence associating these behaviors and cancer recurrence and mortality among survivors.[19,27,55] Our sample demonstrated poorer adherence to aerobic physical activity guidelines than estimates from the general population, which hover at around 50%.[56] Nationally representative studies have similarly observed greater inactivity among cancer survivors compared to adults without a cancer history.[57,58] With respect to dietary behaviors, few

survivors met guidelines regarding minimum American Cancer Society fruit and vegetable consumption. Although suboptimal, fruit and vegetable consumption was higher in our sample of cancer survivors compared to the general population[59] and within the range observed in prior studies with cancer survivors in the U.S.[25,60,61] Less encouragingly, our sample reported higher fast food and sugar-sweetened beverage consumption than the general population. Three quarters of our sample reported eating fast food at least once a week compared to around half of adults surveyed by the U.S. Census Bureau 2014.[62] About half of our sample consumed at least one sugar-sweetened beverage daily, which is nearly twice the rate of daily consumption observed in the 2012 CDC-funded Behavioral Risk Factor Surveillance Survey.[63] Little published research has reported on these behaviors among cancer survivors. Our findings justify the need for dietary interventions among cancer survivors, especially given the high rate of obesity and overweight we observed.

Our findings additionally help to shed light on future intervention development for groups that may benefit most. After controlling for other covariates, higher income was positively associated with consumption of more fruits and vegetables. Higher income may directly reduce financial barriers to purchase healthy foods. In addition, higher income individuals often live in neighborhoods with more grocery stores, better quality foods, and fewer fast food restaurants, all of which facilitate healthy dietary behavior.[64,65] Although income was not associated with fast food consumption, full time employment predicted great consumption, perhaps due to time constraints for food preparation and enhanced access to fast food in the work environment.[66,67] Lower self-efficacy to reduce cancer recurrence risk and higher worry about recurrence were also associated with fast food consumption. Health education interventions that focus on increasing survivors' confidence in making lifestyle improvements (e.g., dietary changes) and in managing their recurrence fears may be helpful in this regard.

Recruitment of an ethnically diverse sample allowed us to explore potential differences between non-Latino white survivors and ethnic minority survivors. Consistent with prior research, we observed the highest rates of overweight and obesity among African American and Latino survivors[60,68,69] and no meaningful racial/ethnic differences in physical activity levels or fruit and vegetable consumption.[60,69] However, our study contributed to the published literature on cancer survivors by including Asians and reporting fast food and sugar-sweetened beverage consumption. Fast food consumption was particularly high among ethnic minorities, including Asians, compared to non-Latino whites.

Successful interventions addressing physical activity and diet among older cancer survivors have included home- and telephone-based interventions targeting goal setting, self-efficacy, and connection to resources to reduce barriers to healthy behaviors,[70–72] but these strategies may need to be adapted for a younger population. Our study also highlights the particular need for interventions to target ethnic minority survivors. There has been an increasing recognition of the central role fast food and sugar-sweetened beverage consumption has played in the obesity epidemic and the need for efforts to reduce intake in the general population.[73] Our results confirm the importance of including racial/ethnic minority cancer survivors in these efforts.

This study has limitations. The data were cross-sectional, limiting causal inferences that can be drawn between identified correlates and poor lifestyle behavior. Data were also self-reported, and thus may be susceptible to social desirability bias or underrepresent sensitive measures such as overweight,[74] which may operate differently depending on the survey administration mode. In addition, we used the same BMI cutoffs for all participants, although prior research has found that some ethnic groups such as Asians may be at increased risk for chronic diseases at lower BMIs than others.[75] Furthermore, our sample was limited to early stage breast and colorectal cancer survivors diagnosed at 50 years of age or earlier and consisted of mostly ethnic minorities. Thus, these findings may not be generalizable to other survivors. In addition, responders were more likely than non-responders to be non-Latino white, female, and breast cancer survivors.

Conclusion

Our study highlights a deficiency in healthy lifestyle behaviors among adult cancer survivors despite their risk for cancer recurrence and downstream chronic disease diagnoses. We purposefully examined a unique group of cancer survivors diagnosed at a young age, who will spend a substantial proportion of their lives as cancer survivors, and for whom improvements in physical activity and dietary behaviors in mid-life may result in substantially reduced chronic disease risk in old age. Future studies with larger sample sizes for each racial/ethnic group could allow for a fuller examination of differences between subgroups in lifestyle behaviors and factors that underlie lifestyle behaviors, which can guide the development of culturally-tailored interventions. Breast and colorectal cancer survivors with early onset disease represent an important cancer survivor subgroup for interventions designed to improve physical activity and dietary behaviors and reduce overweight and obesity.

Acknowledgments

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Table 1.

Demographic and clinical characteristics of respondents (n=156)

Characteristic	
Age at response	
Mean years (sd)	49.6 (5.9)
Range	32 - 69
Gender	**% (n)**
Female	83% (129)
Male	17% (27)
Race/Ethnicity	
Non-Latino White	29% (45)
Latino	24% (37)
African American	15% (24)
Asian American	29% (45)
Chinese	10% (15)
Filipino	6% (10)
Korean	7% (11)
Japanese	6% (9)
Other	3% (4)
Marital status	
Married/Living as married	64% (99)
Other	36% (56)
Education level	
< High school degree	10% (15)
H.S. degree to Some college	41% (64)
College degree	25% (39)
> College graduate	24% (38)
Insurance status	
Insured	84% (130)
Uninsured	16% (24)
Annual household income	
< $50,000	38% (50)
$50,000	62% (82)
Employment status	
Full-time employment	44% (67)
Other	56% (87)
Cancer type	
Breast	68% (106)
Colorectal	32% (50)
Time since diagnosis	
Mean years (sd)	8.8 (3.4)
Range	1 – 16

Characteristic	
Health status	
Excellent	13% (21)
Very good	32% (50)
Good	31% (48)
Fair	18% (28)
Poor	5% (8)
Beliefs [*]	**Mean Score (sd)**
Knowledge of risk factors for cancer recurrence	6.6 (1.5)
Perceived risk for recurrence	1.2 (1.4)
Self-efficacy to reduce recurrence risk	7.7 (1.4)
Knowledge about steps to reduce recurrence	3.8 (0.9)
Worry about recurrence	3.2 (1.3)

Abbreviations: sd, standard deviation

[*] Knowledge of risk factors for cancer recurrence were assessed on a scale from 0-8, 0-4 for perceived risk for cancer recurrence, 2-10 for self-efficacy to reduce recurrence risk, 0-5 for knowledge about steps they could take to reduce recurrence, and 0-5 for worry about recurrence. Higher scores reflect greater knowledge, greater perceived risk, and greater worry.

Table 2.

Body Mass Index (BMI), Physical Activity, and Dietary Behaviors in the Past 7 Days

Current BMI (kg/m^2)	
Mean (sd)	26.5 (5.5)
Range	18.3 - 45.0
Underweight (< 18.5)	1% (2)
Normal (18.5 – 24.9)	44% (64)
Overweight (25.0 – 29.9)	31% (45)
Obese (30.0)	24% (35)
Physical activity: moderate/strenuous exercise	
Average minutes per week among all participants (sd)	118 (127)
Range	0 - 720
< 150 minutes per week	69% (102)
150 minutes per week	31% (46)
Average days of physical activity per week among all participants (sd)	2.6 (2.1)
Range	0 - 7
None	22% (33)
1 - 4 days per week	57% (86)
5 or more days per week	21% (31)
Average minutes of exercise on active days (sd)	43.5 (22.3)
Fruits and vegetable intake	
Average serving per day among all participants (sd)	3.8 (2.6)
Range	0 - 15
None	2% (3)
1 - 4 per day	66% (101)
5 or more per day	32% (50)
Average servings per day (sd) among those who consumed any	3.9 (2.5)
Fast food consumption	
Average times per week (sd) among all participants	2.1 (2.4)
Range	0 - 14
None	25% (39)
1 or more per week	75% (116)
Average times per week (sd) among those who consumed any	2.8 (2.4)
Sugar-sweetened beverage (SSB) consumption	
Average SSB per day (sd) among all participants	1.3 (2.5)
Range	0 - 20
None	52% (81)
1 or more per week	48% (75)
Average SSB per day (sd) among those who consumed any	2.8 (2.9)

Abbreviations: BMI, body mass index; sd, standard deviation; SSB, sugar-sweetened beverage

Table 3.

Unadjusted and adjusted odds ratios (OR) for engaging in physical activity and dietary behaviors

	< 150 minutes/week of physical activity per week		< 5 servings of fruits/vegetables per day		1 fast food per week		1 sugary drink per day	
	Unadj OR (95% CI)	Adj[a] OR (95% CI)	Unadj OR (95% CI)	Adj[a] OR (95% CI)	Unadj OR (95% CI)	Adj[a] OR (95% CI)	Unadj OR (95% CI)	Adj[a] OR (95% CI)
Age (10-year decrease)	1.59 (0.86 - 2.92)	1.47 (0.72 – 3.01)	1.82[+] (0.99 - 3.35)	1.99[+] (0.96 - 4.12)	1.00 (0.54 - 1.84)	0.72 (0.33 - 1.56)	**1.96[*] (1.11 - 3.45)**	1.99[+] (0.96 - 4.14)
Female (Ref: Male)	1.22 (0.50 - 2.98)	1.37 (0.47 - 3.98)	1.38 (0.57 - 3.30)	1.67 (0.60 - 4.67)	0.63 (0.22 - 1.79)	0.66 (0.19 - 2.29)	0.48[+] (0.20 - 1.13)	0.48 (0.17 - 1.37)
Racial/ethnic minority (Ref: Non-Latino White)	1.69 (0.80 - 3.56)	1.82 (0.68 – 4.86)	1.25 (0.60 - 2.62)	0.72 (0.29 - 1.84)	**4.04[*] (1.86 - 8.78)**	**5.37[*] (2.08 - 13.86)**	**2.76[*] (1.32 - 5.75)**	**2.65[*] (1.14 - 6.13)**
Income <$50K (Ref: $50K)	0.91 (0.42 - 1.99)	0.63 (0.25 - 1.62)	**2.56[*] (1.12 - 5.84)**	**2.52[*] (1.001 - 6.33)**	1.06 (0.47 - 2.41)	_b_	1.80 (0.88 - 3.66)	_b_
< College (Ref: College)	1.41 (0.70 - 2.83)	_b_	1.68 (0.85 - 3.31)	_b_	**2.20[*] (1.04 - 4.65)**	1.87 (0.75 - 4.70)	1.68 (0.89 - 3.17)	_b_
Employed full-time (Ref: Other)	1.49 (0.73 - 3.06)	_b_	0.71 (0.36 - 1.40)	_b_	**2.33[*] (1.06 - 5.14)**	**3.17[*] (1.25 - 8.05)**	1.21 (0.64 - 2.29)	_b_
Not married/living as married (Ref: Married/living as married)	0.86 (0.42 - 1.78)	_b_	0.99 (0.49 - 2.01)	_b_	1.78 (0.79 - 4.00)	_b_	**2.19[*] (1.12 - 4.27)**	**2.75[*] (1.28 - 5.91)**
Breast cancer (Ref: Colorectal cancer)	1.17 (0.56 - 2.44)	_b_	0.92 (0.44 - 1.92)	_b_	1.24 (0.58 - 2.67)	_b_	0.79 (0.41 - 1.56)	_b_
Time since diagnosis (2-year increase)	0.99 (0.97 - 1.01)	_b_	0.99 (0.97 - 1.01)	_b_	0.99 (0.97 - 1.01)	_b_	0.99[+] (0.97 - 1.00)	0.99 (0.97 - 1.02)
Good/Fair/Poor health (Ref: Excellent/very good)	**2.86[*] (1.38 - 5.91)**	1.98 (0.80 – 4.91)	1.16 (0.59 - 2.30)	_b_	1.37 (0.66 - 2.83)	_b_	1.75[+] (0.93 - 3.32)	1.34 (0.64 - 2.78)
Knowledge of risk factors for cancer recurrence[c]	**0.70[*] (0.52 - 0.95)**	0.71[+] (0.50 - 1.01)	0.77[+] (0.58 - 1.01)	0.76[+] (0.56 - 1.04)	0.80 (0.60 - 1.07)	_b_	0.86 (0.68 - 1.08)	_b_
Perceived risk for recurrence[c]	1.03 (0.80 - 1.34)	_b_	0.86 (0.67 - 1.10)	_b_	1.16 (0.88 - 1.54)	_b_	**1.39[*] (1.09 - 1.78)**	1.29[+] (0.98 - 1.71)
Self-efficacy to reduce risk (1-point decrease)	**1.37[*] (1.05 - 1.79)**	1.26 (0.92 - 1.73)	1.04 (0.82 - 1.33)	_b_	**1.35[*] (1.02 - 1.78)**	**1.42[*] (1.02 - 1.98)**	1.14 (0.91 - 1.43)	_b_
Worry about recurrence[c]	1.26 (0.95 - 1.67)	_b_	1.03 (0.78 - 1.35)	_b_	**1.38[*] (1.03 - 1.85)**	**1.45[*] (1.02 - 2.05)**	1.07 (0.83 - 1.38)	_b_

[a]Mulivariate logistic models adjusted for demographic characteristics and health beliefs

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b Variables for which the model is not adjusted

c 1-point increase

$+$ p<0.10

$*$ p<0.05

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