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## Cancer Surveillance and Preventive Services in a Diverse Sample of Breast and Colorectal Cancer Survivors

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### Abstract

**Purpose**—Cancer survivors diagnosed at an early age remain at risk for cancer recurrence and other chronic diseases. This study assessed engagement in surveillance for recurrence, cancer screening, and other recommended preventive health services among breast and colorectal cancer survivors with early onset disease (< 50 years) who were diagnosed in California.

**Methods**—Breast and colorectal cancer survivors diagnosed with early-onset cancer between 1999–2009 were identified through the California Cancer Registry, the state-based cancer registry, and surveyed. Multivariable regression analyses were used to assess correlates of receipt of cancer surveillance, cancer screening, and other preventive health services.

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Declarations

**Conflict of interest:** The authors declare that they have no conflict of interest.

**Ethics approval:** This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the University of Southern California, University of California Los Angeles, and California's Committee for the Protection of Human Subjects Institutional Review Boards, as well as the California Cancer Registry.

**Consent to participate:** Informed consent was obtained from all individual participants included in the study.

**Consent to publish:** Not applicable. No identifying information for any participant is included in this article.

**Data availability:** The datasets generated and analyzed during the current study are available from the corresponding author on reasonable request.

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**Results**—Of the 497 survivors that were invited to participate in the study, 156 completed the survey for a response rate of 31%. The sample was 50 years of age on average (range 32–69 years) with a mean time since diagnosis of 9 years. The majority of the sample (71%) was a racial/ethnic minority (24% Latino, 15% African American, 29% Asian). Overall, 80% received appropriate surveillance for recurrence, and 72% received recommended screening for early detection of other cancers (breast, cervical, colorectal). Increasing age was associated with lower likelihood of early detection screening (adjusted odds ratio [aOR] 0.28, 95% confidence interval [CI] 0.11 – 0.69), and higher income was associated with a greater likelihood (aOR 4.89, 95% CI 1.62 – 14.81). Screening rates were highest for blood pressure (96%), cholesterol (86%), and diabetes (81%), followed by dental visits (64%) and flu vaccination (35%). Greater use of recommended preventive health services was associated with increasing age, female sex, higher education level, and having health insurance.

**Conclusions**—Although the majority of survivors received appropriate surveillance for recurrence, engagement in other preventive health services varied substantially.

**Implications for Cancer Survivors**—Efforts are needed to address gaps in use of recommended cancer screening and preventive health services among cancer survivors, particularly survivors with early onset disease who may be at increased risk for additional cancers and common chronic conditions over their lifetime.

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## INTRODUCTION

Over 3.5 million breast cancer survivors and 1.4 million colorectal cancer (CRC) survivors live in the United States [1]. An estimated 19% of breast cancers among females and 15% of colorectal cancers among adults occur before age 50 years [1, 2] and, over recent decades, incidence of these cancers among younger adults has increased [3–5]. With survivors living longer, those diagnosed at an early age with a good prognosis will live much of their adult lives as a cancer survivor, at risk for cancer recurrence, new primary cancers, and other chronic diseases such as diabetes and heart disease. Prior studies have shown that survivors of first primary breast or colorectal cancer are most likely to experience additional cancers [6]. In particular, women with breast cancer diagnosed at a younger age may be at increased risk for experiencing multiple cancers [7–9]. Moreover, cancer survivors have higher prevalence and risk of other chronic conditions, such as obesity and heart disease, compared to individuals without a history of cancer [10–13]. Thus, engagement in both cancer surveillance and preventive health screenings among survivors with early onset disease is important to reduce the burden of chronic disease, new primary cancers, and cancer recurrence among this population.

Although cancer survivors tend to use preventive health services more than individuals without a history of cancer [14–16], there is significant room for improvement [17]. Receipt of cancer surveillance and preventive care among cancer survivors has been associated with higher socioeconomic status [18], health insurance [16, 19, 20], female gender [15], and receiving follow-up care from both a primary care provider and oncology specialist [18, 21, 22]. Many of these studies, however, have included predominantly white survivors [18, 19, 21, 23–26] and also provide minimal insight into behaviors among survivors with early onset disease who are at increased risk for new primary cancers [22, 26].

The purpose of this study was to assess receipt and correlates of receipt of appropriate cancer surveillance, screening for early detection of other cancers, and other recommended preventive health services in cancer survivors. In contrast to prior research, our study focused on individuals diagnosed with early-stage cancer at a young age (< 50 years) and includes a large proportion of racial/ethnic minorities.

## MATERIALS AND METHODS

### Sample

This study was a collaboration between the University of California, Los Angeles (UCLA) and the Los Angeles County (LA) Cancer Surveillance Program (CSP), the population-based cancer registry for Los Angeles County. Detailed methods have been published previously [27]. Briefly, the LA CSP provided contact information for a total of 497 breast and colorectal cancer survivors. Survivors were eligible if they were (a) 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; (b) diagnosed between 1999–2009; and (c) alive at the time of recruitment. Our study purposely focused on survivors with early-onset disease because of their extended lifespan, increased risk for cancer recurrence, and opportunity to reduce chronic disease risk across the lifespan. Furthermore, we oversampled racial/ethnic minority survivors, including Latinos, African Americans, and the four most populous Asian subgroups in Los Angeles (Chinese, Filipino, Korean, Japanese), given lack of prior research among these groups.

### Recruitment

Participants were recruited from July 2012 to May 2013. Prior to contacting eligible participants, we mailed a letter to each survivor's physician informing him or her of the study, our plan to contact the survivor, and instructions to contact the research team within two weeks if they did not believe the survivor should be contacted for research. Fewer than 20 physicians responded, indicating that their patient was deceased, very ill, or undergoing treatment for recurrence, in which case we did not attempt to contact the survivor. We mailed all other survivors an invitation packet describing the study, how their contact information was obtained through the CSP, and the voluntary nature of study participation. The packet also contained a hard copy survey and a self-addressed stamped envelope to return the completed survey. All survivors were mailed the English version of the invitation packet. Within the same mailing, survivors who were Latino, Chinese, or Korean based on CSP records were mailed a translated version of the packet in the relevant language. Our translation methodology involved translation into the target language followed by back-translation into English, and comparison of the original English and back-translated versions to ensure comparability [28–32]. The survey was programmed using Qualtrics software for phone and web administration, though due to programming limitations, the web-based survey was only offered in English.

If a survivor did not return the completed survey or declined to participate within approximately two weeks, the study team followed up by telephone. Survivors were given the option of completing the survey by mail, via a web-based survey, or through a telephone

interview and were mailed a \$20 gift card after survey completion. CSP staff members carried out all recruitment activities and administered telephone surveys to participants that preferred that modality. 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 as well as the California Cancer Registry.

### Data Collection Instrument and Measures

Guided by the Multi-level Health Outcomes Framework [29], the survey assessed factors that may impact receipt of preventive health services among cancer survivors. The Framework illustrates that mutable and immutable factors at the individual, health care system, and community level influence an individual's behavioral intentions and health behavior. The colorectal (160 items) and breast (165 items) cancer survivor surveys focused on individual-level factors and assessed demographic characteristics; timing of most recent colorectal, cervical, and breast cancer screenings; use of preventive health services; cancer-related beliefs; and other related topics that have been previously reported (e.g., lifestyle behaviors, health information preferences) [27]. Survey items were selected from the literature and previously conducted studies [33–37], and surveys took approximately 60 minutes to complete.

**Outcomes**—We examined three primary outcomes: (1) receipt of recommended cancer surveillance; (2) receipt of recommended screenings for early detection of other cancers among women (based on age); and (3) number of other preventive health services received (cholesterol, blood pressure, diabetes, dental visits, flu vaccine).

*Receipt of recommended cancer surveillance* was assessed among all survivors based on guidelines from the American Society of Clinical and the National Comprehensive Cancer Network that were in effect at the time of data collection [38, 39]. Breast cancer survivors were categorized as having received recommended cancer surveillance if they reported receiving a mammogram and clinical breast exam in the past year. CRC survivors were categorized as having received recommended cancer surveillance if they reported having a colonoscopy at any time following completion of their primary treatment. It is important to note that these are minimal guidelines for surveillance. Some survivors in the sample would have been recommended additional surveillance services depending on the treatment received, cancer stage, and other clinical characteristics. Thus, our measure of surveillance may be an overestimate.

*Screening for early detection of other cancers* was assessed only among female participants. We did not assess this outcome among male CRC survivors because no routine cancer screenings, other than for CRC, are recommended for adult males. Receipt of screening for early detection of other cancers was defined as receipt of recommended screening for cervical cancer and CRC (for breast cancer survivors who were age-eligible for both tests) or recommended screening for cervical and breast cancer (for CRC survivors who were age-eligible for both tests). Survivors who were age-eligible for only one early detection screening test were considered screened if they received that test. We constructed these measures using the following age-based recommendations: for cervical cancer screening,

receipt of a Pap test in the past 3 years among women ages  $\geq 65$  years; for breast cancer screening, receipt of a mammogram in the past 2 years among women  $\geq 50$  years; for CRC screening, receipt of a colonoscopy in the past 10 years, sigmoidoscopy in the past 5 years, or fecal occult blood or fecal immunochemical test in the past year among women ages  $\geq 50$  years [40–42].

The survey also assessed use of five other preventive health services by asking participants when they last had a blood pressure check, cholesterol check, blood test for diabetes, dentist visit, and flu vaccination [36]. *Number of preventive health services received* was defined as total number of recommended services received (range 0–5), defined as receipt of a dental visit or flu vaccine in the past year, or blood pressure, cholesterol, or diabetes screening in the past two years [43–47].

**Correlates**—CSP data captured participant age, sex, and date and type of cancer diagnosis. The survey assessed self-identified race/ethnicity, income, education level, employment status, marital status, and several psychosocial variables. *Knowledge of risk factors for cancer recurrence* was measured through eight questions asking whether participants believed certain factors increase, decrease, or do not affect cancer risk (range 0–8) [37]. *Perceived risk for recurrence* was measured using two questions asking the degree to which survivors thought cancer recurrence and development of another cancer was likely (range 0–4) [33]. *Self-efficacy to reduce recurrence risk* was measured with two questions asking the degree to which survivors agreed with statements about their ability to engage in better self-care and prevent cancer recurrence (range 2–10) [34, 36]. Perceived *knowledge about steps to reduce recurrence* [35] and *worry about recurrence* [34] was each assessed with a single item (range 0–5). Higher scores on these measures reflect greater knowledge of risk factors for cancer recurrence, perceived risk for recurrence, self-efficacy to reduce recurrence risk, knowledge about strategies to reduce recurrence, and worry about recurrence, respectively.

### Statistical Analysis

Descriptive statistics were used to characterize demographic and psychosocial factors, cancer surveillance, receipt of recommended screening for early detection of other cancers, and use of preventive health services. Bivariate relationships between potential correlates and study outcomes were assessed using chi-square test of proportions, t-tests, and univariate regression. Multivariable logistic regression analyses were used to identify correlates of cancer surveillance, and other cancer screening, and multivariable linear regression analyses were used to identify correlates of number of preventive health services received (continuous outcome), controlling for other factors. For the analysis of cancer surveillance, 15 breast cancer survivors who received a double mastectomy or had missing responses and 7 colorectal cancer survivors who underwent colon resection treatment or had missing responses were excluded. Participants with double mastectomy or colon resection were excluded because surveillance recommendations are different for these survivors compared to those who receive less invasive treatments.

Bivariate associations of correlates with study outcomes ( $p < 0.10$ ), tests of collinearity and goodness of fit, and conceptual importance were considered when building the final adjusted

models. Covariates included age at study participation (10-year increments), gender (female vs. male), race/ethnicity (non-Latino White vs. racial/ethnic minority), marital status (married/living as married vs. not married), education (college degree vs. < college degree), insurance status (insured vs. uninsured), annual household income (> \$50,000 vs. < \$50,000), employment status (full-time vs. other), cancer type (breast vs. colorectal), time since diagnosis (continuous), knowledge about risk factors for cancer recurrence (continuous), perceived risk for recurrence (continuous), self-efficacy to reduce recurrence risk (continuous), knowledge about strategies to reduce recurrence (continuous), and worry about recurrence (continuous). Unadjusted and adjusted odds ratios (OR) with 95% confidence intervals (95% CI) are presented. Statistical significance of variables in the final model was assessed at the 0.05 level. SAS version 9.4 (SAS Institute, Inc., Cary, NC) was used for all analyses.

## RESULTS

### Outcome of recruitment

We initiated contact with 497 survivors including 120 non-Latino Whites and 377 racial/ethnic minorities (85 African American, 120 Latino, 172 Asian). The final sample included 156 survivors (106 breast, 50 colorectal) for an overall response rate of 31%. The most common reasons for survey non-completion were the inability to contact a survivor due to invalid contact information (32%, 160/497) and patient refusal (30%, 148/497). Response rates were comparable across age at diagnosis, diagnosis year, and neighborhood socioeconomic status based on CSP tract-level data. However, non-Latino White, breast cancer, and female survivors were significantly more likely to participate than racial/ethnic minorities, CRC survivors, and male survivors [48].

### Sample characteristics

Table 1 presents sample characteristics. Among all survivors (n = 156), the majority were female (83%, breast n = 106, colorectal n = 23), did not have a college degree (51%), were married or living as married (64%), had an income of > \$50,000 (62%), had health insurance (84%), and were a racial/ethnic minority (71% including 24% Latino, 15% African American, and 29% Asian). The mean age at diagnosis was 41 years (SD 5.1), and survivors participated in the study on average 9 years after diagnosis (SD 3.4; Range = 1–16 years). Ninety-two percent of survivors (143/156) reported having already completed their cancer treatments. The majority of the 13 participants reported being in treatment at the time of the study were breast cancer survivors receiving hormone therapy. On average, participants were knowledgeable about risk factors for cancer recurrence (mean score 6.64/8) and steps to reduce recurrence (3.77/5) and had high self-efficacy to reduce recurrence risk (7.66/8). Although survivors perceived low risk for recurrence (1.22/5), they reported moderate worry about recurrence (3.21/5).

### Surveillance for cancer recurrence

Among all eligible survivors, 80% (107/134) received recommended cancer surveillance (Table 1), and this proportion was comparable across breast and colorectal cancer survivor groups. Although small cell sizes prohibit direct comparisons across ethnic groups, cancer

surveillance rates overall were lowest among Asians (72%, 31/43) and similar among Latinos (84%, 27/32), Non-Latino Whites (82%, 28/34), and African Americans (81%, 17/21) (data not shown in table). In unadjusted analyses, full-time employment was associated with a higher likelihood of receiving appropriate cancer surveillance. However, no significant correlates emerged in adjusted analyses (Table 2).

### Screening for early detection of other cancers (women only)

Among eligible women, 72% (93/129) received recommended screening for early detection of other cancers (Table 1). Overall, African American women had the highest unadjusted rates of screening for early detection of other cancers according to guidelines (79%, 15/19), followed by Asians (74%, 31/42), Latinas (71%, 22/31), and non-Latina Whites (64%, 21/33) (data not shown in table). Among breast cancer survivors, 86% (90/105) received recommended screening for cervical cancer and 65% (35/54) for colorectal cancer. The most common colorectal cancer screening modality used ( $n = 54$ ) was colonoscopy (50%), followed by fecal occult blood test (20%) and sigmoidoscopy (9%) (data not shown). Among female colorectal cancer survivors ( $n = 23$ ), 93% (14/15) received recommended screening for breast cancer, and 78% (18/23) for cervical cancer (data not shown). In both unadjusted and adjusted analyses, increasing age was associated with lower likelihood of screening for early detection of other cancers, while higher annual household income ( $\geq \$50,000$ ) was associated with higher likelihood of screening (Table 2).

### Receipt of preventive health services

Among all participants ( $n = 156$ ), the highest rates of screening were observed for blood pressure (96%), cholesterol (86%), and diabetes (81%) within the past two years; proportionally fewer survivors had a dental visit (64%) or flu vaccine (35%) in the past year (Table 1). Mean number of preventive health services was similar across racial/ethnic groups (data not shown). While rates of blood pressure screening and flu vaccination were similar across racial/ethnic groups, receipt of cholesterol, glucose, and dental screening varied. Cholesterol and diabetes screening rates were lowest among Latinos, while African Americans were least likely to receive recommended dental care (data not shown).

Tables 3 and 4 present bivariate and multivariable results for number of preventive health services received. On average, participants used 3.65 (SD 1.20) preventive health services. In unadjusted analyses, receipt of a greater mean number of services was associated with having a college degree vs. not (3.93 vs. 3.38), being employed full-time vs. not (3.88 vs. 3.46), being insured vs. uninsured (3.80 vs. 3.04), being greater than age 50 years vs.  $\leq 50$  years (3.82 vs. 3.50), and having an annual household income of  $\geq \$50,000$  vs.  $< \$50,000$  (3.91 vs. 3.28) (all  $p < 0.05$ ). In multivariable analyses, receipt of a higher number of preventive health services was associated with increasing age ( $\beta = 0.44$ , s.e. 0.18), female gender ( $\beta = 0.67$ , s.e. 0.32), higher educational level ( $\beta = 0.41$ , s.e. 0.18), and having health insurance ( $\beta = 0.58$ , s.e. 0.25) (all  $p < 0.05$ ).

## DISCUSSION

This study extends prior research on cancer screening and preventive health behaviors among cancer survivors by focusing on an ethnically diverse sample of individuals with early-stage and early-onset cancer. Understanding behaviors from this younger, diverse population merits particular attention, given their extended lifespan and their susceptibility to cancer recurrence and development of additional comorbidities over their lifespan. Consistent with previous literature noting gaps in cancer surveillance [49, 50], we found one in five survivors did not meet cancer surveillance guidelines. Receipt of screening for early detection of other cancers varied by screening type, ranging from 65% to 93%, and was negatively associated with increasing age and lower income. Similarly, there was a wide range in rates of receipt of other preventive health services, with receipt of a greater number of services associated with increasing age, female gender, higher education, and having health insurance. Previous studies have identified disparities in survivorship care among racial/ethnic minority subgroups [49, 51]. Although we observed a few ethnic subgroup differences in our study, we did not find an effect of being a racial/ethnic minority on receipt of appropriate cancer surveillance, screening for early detection of other cancers, or other preventive services.

Rates of breast cancer screening observed in our sample were comparable to national estimates among non-elderly female cancer survivors (around 90%) [52], but lower for colorectal cancer (65% in our sample vs. 75% nationally) [53]. Similar to the general population, the substantially lower rates of colorectal versus breast cancer screening may reflect unique challenges to CRC screening such as bowel preparation, invasive procedures, and wide variation in screening interval depending on screening modality. The lower rate of CRC screening is concerning, given that a recent meta-analysis found that individuals diagnosed with breast cancer at a younger (< 50 years) versus older age were 2.5 times more likely to develop CRC [54]. Remaining gaps identified in our research highlight the need for efforts to improve screening for early detection of cancers among survivors. Use of evidence-based interventions (e.g., reminders, one-on-one education) may have the potential to address these gaps [55].

We also found that survivors who were older were less likely to complete screening for early detection, which was not expected. The reason for this finding is not clear, but could be due to higher prioritization of other health conditions with increasing age. Notably, our sample was younger relative to other studies examining preventive health service use in cancer survivors [14, 15, 56]. Not surprisingly, higher income was associated with receipt of early detection screening, underscoring potential access barriers driven by cost among non-elderly adults. In addition, a higher proportion of breast versus colorectal cancer female survivors received cervical cancer screening, which could reflect greater attentiveness to women's preventive health in this group. Although a systematic review found cancer survivors are more likely to use screening for breast, colorectal, and cervical cancer compared to individuals without cancer [17], our results illustrate the need for continued improvement, particularly for CRC screening, older age groups, and those with lower incomes.



Uptake of blood pressure (96%), cholesterol (86%), and diabetes (81%) screening and dental services (64%) among our participants was similar to prior research [16, 20, 24, 57]. Influenza vaccination rates were also comparable to those reported among a national sample of non-elderly cancer survivors and survivors of adolescent and young adult cancer [20, 58], but lower than estimates among Medicare populations [21, 24, 59]. Less frequent participation in dental care and flu vaccination may reflect lower prioritization of these services compared to other clinical preventive services and prohibitive costs for dental services in particular. Cancer survivors have been shown to be more likely to forgo some health services due to cost compared to those with no history [60], and specifically sacrifice dental services at a greater rate than other services [20, 60]. Further, consistent with previous studies identifying socioeconomic status and health care access as predictors of receipt of preventive health services among cancer survivors [16, 18–21, 61], we similarly found higher education and insurance were associated with use of more services. These findings support interventions that promote engagement in preventive care among lower-educated populations, as well as efforts to improve access to these services among those un- or under-insured.

Study limitations should be noted. First, similar to other studies using cross-sectional surveys, ours was subject to potential misclassification, social desirability bias, and limitations to drawing causal inferences. Self-reported cancer screening tends to be over-reported, at least for breast cancer [62–66], which would result in an underestimate of our sample's actual need for survivorship care. Second, due to a limited response rate and potential self-selection bias (with healthier/more engaged survivors being more likely to participate in the survey), results may have overestimated the use of cancer surveillance, cancer screening and preventive health services among those with early onset disease. It is worth noting that our response rate is within the range of population-based surveys, such as the Behavioral Risk Factor Surveillance Survey and the California Health Interview Survey, which similarly use remote outreach to a population-based sample who is unfamiliar with the data collection team [67–69]. The majority of participants were insured and were at least middle income, limiting generalizability to survivors with lower socioeconomic status. However, it should be noted that the insurance rate and education level we observed in our sample are similar to the published literature for cancer survivors participating in population-based studies [70–73]. Our findings may not generalize to cancer survivors diagnosed at an older age, but fill an important gap in the literature among younger populations who are at greater risk of recurrence and development of chronic diseases throughout their remaining years of life. While our data collection occurred in 2013, there is evidence that preventive service use among cancer survivors remains suboptimal to this day [20, 49, 57], underscoring the importance of identifying drivers of preventive service use among the growing population of cancer survivors with early onset disease [5, 74]. Our sample was limited to cancer survivors in Los Angeles, which may limit generalizability to other geographical areas. Finally, our sample size may have limited the ability to adequately control for potential confounders or explore differences in rates of receipt of preventive services and cancer screening among minority subgroups, warranting further exploration by future studies with larger sample sizes.

## Conclusions

Our findings suggest efforts may be required to address the comprehensive healthcare needs of survivors. Future studies should continue to explore explanations for gaps in cancer screening and preventive care, and importantly, explore whether primary or specialty care may be the most appropriate setting for these efforts. Findings from this study are intended to inform interventions for adult cancer survivors diagnosed at a young age to improve primary prevention and reduce long-term risk of recurrence in this understudied population.

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**Table 1.**

Sample characteristics (n = 156)

Characteristic	% (n)
<b>Age at response</b>	
Mean years (SD) <sup>a</sup>	49.6 (5.93)
Range	32 – 69
32–40 years	6% (10)
41–49 years	40% (62)
50–69 years	54% (84)
<b>Gender</b>	
Female	83% (129)
Male	17% (27)
<b>Race/ethnicity</b>	
Non-Latino White Latino	29% (45)
Latino	24% (37)
African American	15% (24)
Asian	29% (45)
Chinese	10% (15)
Filipino	6% (10)
Korean	7% (11)
Japanese	6% (9)
Other	3% (4)
<b>Marital status</b>	
Married/Living as married	64% (99)
Other	36% (56)
<b>Education level</b>	
< High school diploma or equivalent	10% (15)
High school diploma to some college	41% (64)
College degree	25% (39)
> College degree	24% (38)
<b>Insurance status</b>	
Insured	84% (130)
Uninsured	16% (24)
<b>Annual household income</b>	
< \$50,000	38% (50)
> \$50,000	62% (82)
<b>Employment status</b>	
Full-time employment	44% (67)
Non full-time employment	56% (87)
<b>Cancer type</b>	
Breast	68% (106)
Colorectal	32% (50)
<b>Time since diagnosis</b>	

Characteristic	% (n)
Mean years (SD) <sup>a</sup>	8.8 (3.42)
Range	1 – 16
<b>Health status</b>	
Excellent	13% (21)
Very good	32% (50)
Good	31% (48)
Fair	18% (28)
Poor	5% (8)
<b>Psychosocial factors, mean score (SD)<sup>a,b</sup></b>	
Knowledge of risk factors for cancer recurrence	6.64 (1.47)
Perceived risk for recurrence	1.22 (1.36)
Self-efficacy to reduce recurrence risk	7.66 (1.43)
Knowledge about steps to reduce recurrence	3.77 (0.92)
Worry about recurrence	3.21 (1.26)
<b>Outcomes</b>	
Recommended cancer surveillance (n = 134)	80% (107)
Recommended screening for early detection of other cancers (women only; n = 129)	72% (93)
Blood pressure check in past 2 years	96% (150)
Cholesterol screen in past 2 years	86% (134)
Diabetes check in past 2 years	81% (127)
Dental visit in past year	64% (100)
Flu vaccination in past year	35% (55)

<sup>a</sup>SD, standard deviation

<sup>b</sup>Psychosocial factors were assessed on a scale from 0–8 for knowledge of risk factors for cancer recurrence, 0–4 for perceived risk for cancer recurrence, 2–10 for self-efficacy to reduce recurrence risk, 0–5 for knowledge about steps to reduce recurrence, and 0–5 for worry about recurrence. Higher scores reflect greater knowledge, perceived risk, self-efficacy, and worry.



Unadjusted and adjusted odds ratios (OR) for receipt of screening for cancer surveillance and early detection of other cancers

**Table 2.**

	Received cancer surveillance (n = 115)		Received screening for early detection of other cancers (women only: n = 105)	
	Unadj. OR (95% CI)	Adj. OR (95% CI)	Unadj. OR (95% CI)	Adj. OR (95% CI)
Age at response (10-year increase)	0.51 (0.23 – 1.10)	0.44(0.18 – 1.06)	<b>0.35 (0.16 – 0.77)*</b>	<b>0.28 (0.11 – 0.69)*</b>
Female (Ref: Male)	1.20 (0.40 – 3.62)	--	-- <sup>a</sup>	-- <sup>a</sup>
Non-Latino White (Ref: Racial/ethnic minority)	1.26 (0.46 – 3.43)	1.08 (0.32n – 3.67)	0.59 (0.25 – 1.38)	0.34 (0.11 – 1.08)
Married/living as married (Ref: Not married)	0.44 (0.16 – 1.17)	0.33 0.33 (0.10 – 1.05)	1.55 (0.70 – 3.44)	1.01 (0.37 – 2.73)
College degree (Ref: < College degree)	1.02 (0.44 – 2.37)	--	1.14 (0.53 – 2.47)	--
Insured (Ref: Uninsured)	2.71 (0.95 – 7.75)	--	2.05 (0.71 – 5.90)	--
Annual household income > \$50,000 (Ref: < \$50,000)	1.85 (0.75 – 4.52)	2.29 (0.78 – 6.72)	<b>2.98 (1.27 – 6.99)*</b>	<b>4.89 (1.62 – 14.81)*</b>
Full-time employment (Ref: Other)	<b>2.82 (1.09 – 7.26)*</b>	2.06 (0.73 – 5.84)	0.90 (0.41 – 1.97)	0.64 (0.24 – 1.71)
Breast cancer (Ref: Colorectal)	1.07 (0.44 – 2.63)	--	0.67 (0.23 – 1.97)	--
Time (years) since diagnosis	0.99 (0.98 – 1.01)	--	0.99 (0.98 – 1.00)	--
Knowledge of risk factors for cancer recurrence <sup>b</sup>	0.85 (0.61 – 1.17)	--	1.11 (0.86 – 1.44)	--
Perceived risk for recurrence <sup>b</sup>	1.09 (0.78 – 1.53)	--	1.06 (0.79 – 1.43)	--
Self-efficacy to reduce recurrence risk <sup>b</sup>	1.04 (0.77 – 1.39)	--	0.94 (0.71 – 1.24)	--
Knowledge about strategies to reduce recurrence <sup>b</sup>	1.56 (0.99 – 2.44)	1.43 (0.89 – 2.29)	1.11 (0.74 – 1.67)	1.16 (0.72 – 1.86)
Worry about recurrence <sup>b</sup>	0.90 (0.64 – 1.26)	--	1.25 (0.92 – 1.70)	--

\* p<0.05

<sup>a</sup>Not applicable; analysis among women only

<sup>b</sup>Psychosocial factors were assessed on a scale from 0–8 for knowledge of risk factors for cancer recurrence, 0–4 for perceived risk for cancer recurrence, 2–10 for self-efficacy to reduce recurrence risk, 0–5 for knowledge about steps to reduce recurrence, and 0–5 for worry about recurrence. Higher scores reflect greater knowledge, perceived risk, self-efficacy, and worry.

**Table 3.**Average number of preventive health services received by sample characteristics<sup>a</sup>

Characteristic	Mean (SD);	P-Value
<b>All</b>	3.65 (1.20)	0.09
<b>Age at response</b>		
< 50 years old	3.50 (1.28)	
> 50 years old	3.82 (1.08)	0.22
<b>Gender</b>		
Female	3.73 (1.05)	
Male	3.30 (1.73)	
<b>Race/ethnicity</b>		0.47
Non-Latino White	3.77 (1.18)	
Racial/ethnic minority	3.62 (1.20)	
<b>Marital status</b>		0.94
Married/living as married	3.66 (1.04)	
Not married	3.67 (1.44)	
<b>Education level*</b>		0.004
< College degree	3.38 (1.33)	
> College degree	3.93 (0.97)	
<b>Insurance status*</b>		0.02
Insured	3.80 (1.06)	
Uninsured	3.04 (1.49)	
<b>Annual household income*</b>		
> \$50,000	3.91 (0.95)	
< \$50,000	3.28 (1.28)	
<b>Employment status*</b>		0.04
Full-time	3.88 (1.16)	
Non full-time	3.49 (1.21)	
<b>Cancer site</b>		0.84
Breast	3.67 (1.05)	
Colorectal	3.62 (1.47)	
<b>Time since diagnosis</b>		
< 5 years	3.50 (1.20)	
> 5 years	3.72 (1.17)	

\*  
p<0.05

<sup>a</sup>Preventive health services use defined as total number of the following health services used (range 0–5): (1) a cholesterol screen, or (2) blood pressure check, or (3) blood test for diabetes or high blood sugar in the past 2 years, or (4) flu vaccination or (5) dental visit in the past year.

**Table 4.**

Factors associated with number of preventive health services received (n = 128)

	Unadj. $\beta$ (s.e.)	Adj. $\beta$ (s.e.)
Age at response (10-year increase)	<b>0.56 (0.16)</b> *	<b>0.44 (0.18)</b> *
Female (Ref: Male)	0.43 (0.25)	<b>0.67 (0.32)</b> *
Non-Latino White (Ref: Racial/ethnic minority)	0.15 (0.21)	-0.17 (0.21)
Married/living as married (Ref: Other)	-0.02 (0.20)	--
College degree (Ref: < College degree)	<b>0.55 (0.19)</b> *	<b>0.41 (0.18)</b> *
Insured (Ref: Uninsured)	<b>0.76 (0.25)</b> *	<b>0.58 (0.25)</b> *
Annual household income > \$50,000 (Ref: < \$50,000)	<b>-0.63 (0.20)</b> *	--
Full-time employment (Ref: Other)	<b>0.39 (0.19)</b> *	--
Breast cancer (Ref: Colorectal)	0.05 (0.21)	-0.42 (0.27)
Time (years) since diagnosis	0.05 (0.03)	-0.00 (0.03)

\*  
p<0.05

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