Research Article

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Partnership Status and Socioeconomic Factors in Relation to Health Behavior Changes after a Diagnosis of Ductal Carcinoma *In Situ*

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Abstract

Background: Change in health behaviors can occur among women newly diagnosed with ductal carcinoma *in situ* (DCIS). We sought to understand whether partnership status and socioeconomic status (SES) affected behavioral changes in body weight, physical activity, alcohol consumption, and smoking.

Methods: The Wisconsin *In Situ* Cohort (WISC) study comprises 1,382 women diagnosed with DCIS with information on demographics, SES factors, and pre- and post-DCIS diagnosis health-related behaviors. Logistic regression models were used to determine the association between partnership status, education, and income with change in behavior variables.

Results: Higher educational attainment was associated with lower likelihood of stopping physical activity [OR, 0.45; 95% confidence interval (CI), 0.32–0.63; college vs. high school degree], or starting to drink alcohol (OR, 0.34; 95% CI, 0.15–0.80). Results suggested that higher family income was associated with lower likelihood of gaining >5% body mass index ($P = 0.07$) or stopping physical activity ($P = 0.09$). Living with a partner was not strongly associated with behavior changes.

Conclusion: Higher educational attainment and higher income, but not living with a partner, were associated with positive health behaviors after a DCIS diagnosis.

Impact: The associations between higher educational attainment and, to a lesser extent, higher income with positive health behaviors underscore the importance of considering SES when identifying those at risk for negative behavioral change after DCIS diagnosis. *Cancer Epidemiol Biomarkers Prev; 25(1); 76–82.* ©2015 AACR.

Introduction

Ductal carcinoma *in situ* (DCIS), a noninvasive stage-0 breast cancer consists of the clonal proliferation of malignant-appearing cells that are bounded by the basement membrane of the breast ducts (1). DCIS is a nonobligate precursor lesion that has the potential to transform into an invasive cancer over time, which can range from a few years to decades (2). Breast cancer remains the most common cancer among U.S. women; about 231,840 new cases of invasive breast cancer and 50,000 new cases of DCIS are estimated in 2015 (3). Women with DCIS are four times more likely to develop invasive breast cancer than the general population (4). However, given current surveillance strategies and treatment, 96% of DCIS patients will survive breast cancer and ultimately die of competing causes (5).

Like the general population, the most frequent cause of death among DCIS patients is cardiovascular disease (CVD; ref. 6). Risk of breast cancer death and CVD death are both influenced by health-related behaviors. Many DCIS patients have poor health-related behaviors at the time of diagnosis, and these can be exacerbated during and after the diagnosis of DCIS and its treatment. Sprague and colleagues (7) found that women after a DCIS diagnosis were more likely to gain weight and use antidepressants, but on average had little or no change in alcohol intake and a substantial fraction either quit or substantially decreased smoking. Ligibel and colleagues (8) assessed physical activity behavior in 487 women with newly diagnosed DCIS, and found women were physically inactive at diagnosis and remained so over an 18-month period. Given the competing risk of CVD in this population, it is important to understand what drives health behaviors among women newly diagnosed with DCIS and identify those most at risk of adverse changes.

Prior studies have shown a strong correlation between key indicators of SES, such as education and income, and health behavior (9). Furthermore, partnership status is known to affect health behaviors such as physical activity, diet, smoking, and alcohol intake (10). In contrast, two studies reported that, among women diagnosed with invasive breast cancer, marital status was not related to change in recreational physical activity (11), and that partnership status was not associated with change in tobacco use, alcohol consumption, or body mass index (BMI; ref. 12). However, the extent to which partnership status and SES are associated with change in health behavior

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among DCIS patients has not been previously studied. To address this question, we used the Wisconsin *In Situ* Cohort (WISC) study comprised of 1,925 women with demographic information, SES factors, and health behaviors that were assessed pre- and post-DCIS diagnosis. In this study, we hypothesized that living with a partner, having a higher educational attainment, and higher income would have a positive impact on health behavior after a DCIS diagnosis.

Materials and Methods

Study population

The WISC study has been described in previously (7, 13, 14). Briefly, the WISC study recruited 1,925 women ages 20 to 74 with an incident first primary DCIS diagnosis between 1995 and 2006 from the mandatory state-wide Wisconsin Cancer Reporting System (14). Informed verbal consent was obtained from all participants and the study has been approved by both the University of Wisconsin Health Sciences Institutional Review Board and the University of Vermont Medical Center Institutional Review Board.

Data collection

This study analyzed data collected from 1997 through 2010. Participants completed an initial telephone interview when enrolled in the study. Baseline interviews were conducted an average of 1.3 years following diagnosis. Enrollment eligibility and participation is shown in Fig. 1. Patients were eligible to be recontacted if a minimum of 2 years had passed since their last telephone interview. Because women initially enrolled in the study at different periods of time and the eligibility for recontact remained at least 2 years, recontact periods overlapped. Consequently, not all patients in the study were eligible for a specific cycle of recontact interviews. Among patients eligible for the first recontact interview, the participation rate was 79%. For the second recontact interview, 85% of eligible women participated. Seventy-three percent participated in the third recontact interview. Women who completed only the baseline interview but did not complete any follow-up surveys were similar to women who continued to participate in the study according to racial descent, comorbidity level, BMI, physical activity, and alcohol intake; women who did not participate in subsequent waves of data collection tended to have less education, lower income, and were less likely to report living with a partner (Supplementary Table S1).

The baseline telephone interview elicited patient demographic information, health behaviors, medication use, comorbidities, and socioeconomic status (SES) factors (7, 13). Subjects were asked to recall body weight, physical activity participation, alcohol consumption, and smoking habits 1 year before diagnosis. BMI was calculated as weight (kg) divided by squared height (m^2). The duration and frequency per week of each type of physical activity for each participant was summed to obtain hours/week of physical activity. For alcohol use, participants were asked to recall the number of bottles or cans of beer, glasses of wine, and drinks of hard liquor consumed per day, week, or month. Smoking status was obtained at baseline by asking whether participants had smoked more than 100 cigarettes in their lifetime and if they were current smokers. At the recontact questionnaires, subjects were asked to update their current body weight, physical activity, alcohol consumption, and smoking habits.

Baseline data in the WISC cohort included patients' "partnership status"—whether or not they were living with a spouse or partner, as well as SES factors (education and income). Participants' education levels were defined as less than high school degree, high school degree, some college, and having a college degree. Annual household income was categorized into four levels: $\leq$\$30,000, \$30,001 to 50,000, \$50,001 to 100,000, and >\$100,000. Diagnosis with 21 comorbidities based on the Charlson Comorbidity index (15) was self-reported and summarized for statistical analysis.

We excluded 162 women who reported a second breast cancer event during follow-up, as treatment may affect behavior change. A total of 381 women provided no behavior information beyond baseline and were thus excluded, leaving a study population of 1,382 women.

Statistical analysis

The overall analytic plan was based on analysis of several exposure variables, including partnership status and SES factors (household income and education) in relation to the outcomes of change in lifestyle behavior (BMI, physical activity, alcohol intake, and smoking status) after diagnosis. Change in behavior was defined as the differences between recalled prediagnosis levels 1 year before diagnosis and the first recontact levels post-diagnosis. Also, change in behavior was referred to as

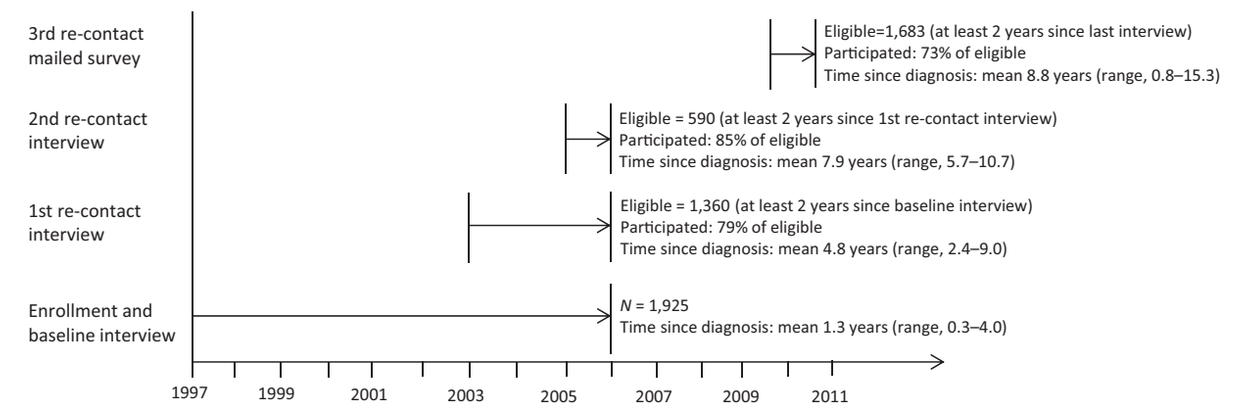

Figure 1.
WISC study eligibility and participation according to year of enrollment, 1997 to 2011.

"positive health behavior" when any potential or actual impact has positive outcomes. Conversely, negative health behavior was associated with negative health outcomes.

Missing values for all covariates and behaviors at each data collection period were estimated using multiple imputation with 10 imputations (16). The imputation model included all covariates listed in Table 1 in addition to menopausal status, family history of breast cancer, use of posttreatment endocrine therapy (tamoxifen, raloxifene, and aromatase inhibitors), surgical treatment type, mammographic screening history, and use of postmenopausal hormone therapy, all assessed at the baseline interview. Regression analyses used the combined results of the 10 imputations to create valid statistical inferences that account for the uncertainty created by the missing values (17, 18). Where variables with imputed values were categorized for presentation, classification of subjects into categories was based on the mode of the 10 estimated values for each subject created under the imputation model.

Table 1. Selected characteristics of the study population at baseline ($N = 1{,}382$): WISC 1997–2011

Characteristic	*N* (%)[a]
Age, y	
20–44	157 (11.4)
45–54	508 (36.8)
55–64	449 (32.5)
65–74	268 (19.4)
Ancestry	
European-American	1,327 (96.0)
African-American	28 (2.1)
Other or multicultural	27 (1.9)
Number of comorbidities	
None	987 (71.4)
1	261 (18.9)
2	106 (7.7)
≥3	28 (2.0)
Partnership status	
Not living with a partner	226 (16.3)
Living with a partner	1,156 (83.7)
Education	
No high school degree	57 (4.1)
High school degree	521 (37.7)
Some college	380 (27.5)
College degree	424 (30.7)
Income	
≤$30,000	269 (19.5)
$30,001–50,000	458 (33.1)
$50,001–100,000	500 (36.2)
≥$100,001	155 (11.2)
BMI, kg/m^2	
Underweight and normal: <25	650 (47.0)
Overweight: 25–29.9	450 (32.6)
Obese: ≥30	282 (20.4)
Physical activity, h/wk	
No activity	371 (26.8)
0.1–2	701 (50.7)
2.1–5	226 (16.4)
>5	219 (15.9)
Alcohol intake, drinks/wk	
Non-drinker	236 (17.1)
0.1–1.9	701 (50.7)
2–6.9	226 (16.4)
≥7	219 (15.8)
Smoking status	
Non-smoker or former smoker	1,187 (85.9)
Current smoker	195 (14.1)

[a]Values were imputed for women missing information on ancestry ($N = 3$, 0.2%), number of comorbidities ($N = 603$, 44%), income ($N = 429$, 31%), BMI ($N = 69$, 5%), and smoking status ($N = 5$, 0.4%). Information was complete for all other variables.

We used multivariate logistic regression to determine the effect of partnership status and SES factors on change in behavior after a DCIS diagnosis. Change in BMI (gain or loss >5%) was categorized on the basis of the difference in BMI since prediagnosis. Physical activity (sedentary/any), alcohol intake (none/any), and current smoking (no/yes) were categorized at the two time points, pre- and first post-diagnosis wave of data collection. Women who initiated a behavior during the study period were compared with those who consistently did not participate in the behavior. Women who stopped a behavior during the study period were compared with those who consistently participated in that behavior. Separate models were constructed for each SES factor and change in behavior outcome. To reduce the potential influence of multiple comparisons on statistical analysis, the overall statistical significance of each SES factor in the regression model was tested by comparing the model with and without the addition of that SES factor; OR estimates are presented for all factors, but examined closely only for those with overall P values <0.05.

Each model was adjusted for the following confounding factors: age at diagnosis, time between interviews, calendar year of diagnosis, and the number of reported comorbidities at baseline. Comorbidity information was not collected at baseline for women enrolled from 1997 to 2000. Therefore, the number of comorbidities was imputed for these women (43.6% of study population).

All statistical analysis was performed using SAS statistical software Version 9.3 (SAS Institute Inc.). Effects were considered significant at $P < 0.05$ level.

Results

The mean age at enrollment in the WISC study was 55.5 years. Approximately 16% of women were living alone at baseline, 30% had a college degree, and 11% had a household income over $100,000 yearly. More than 50% of the cohort was overweight or obese (Table 1). Twenty-seven percent did not participate in any physical activity. Alcohol use was common among participants, though a majority of women consumed fewer than 2 drinks per week. Current smoking was prevalent in 14% of the cohort at baseline.

Table 2 demonstrates associations between partnership status, education, household income, and change in BMI from 1 year prediagnosis to the first post-diagnosis interview. Neither partnership status nor either of the SES variables were significantly associated with gaining or losing >5% BMI. However, results suggested that women with greater income were less likely to gain >5% BMI since diagnosis ($P = 0.07$).

Among women who were physically active at 1 year prediagnosis, those with at least some college education were less likely to stop activity by the earliest recontact than those with no education beyond high school [OR, 0.69; 95% confidence interval (CI), 0.50–0.96 for some college; OR, 0.45; 95% CI, 0.32–0.63; for college degree; Table 3). Although change in physical activity was not significantly associated with partnership status or income, there was a suggestion that greater income was associated with reduced risk of stopping physical activity after diagnosis ($P = 0.09$).

Among women who reported not consuming alcohol at 1 year prediagnosis, those with more education were less likely to start

Table 2. Multivariable association between partnership status, income, and education at baseline and change in BMI from 1 year prediagnosis to the earliest recontact ($N = 1{,}382$): WISC 1997–2011

	>5% loss "cases" *N* (%)	Stable ±5% "controls" *N* (%)	OR[a] (95% CI)	Overall *P* value	>5% gain "cases" *N* (%)	Stable ±5% "controls" *N* (%)	OR[a] (95% CI)	Overall *P* value
Partnership status								
Not living with a partner	33 (16.4)	84 (15.4)	1 (Ref.)	0.88	110 (17.2)	84 (15.4)	1 (Ref.)	0.25
Living with a partner	168 (83.6)	462 (84.6)	0.96 (0.60–1.54)		531 (82.8)	462 (84.6)	0.83 (0.60–1.15)	
Education								
No high school degree	9 (4.5)	20 (3.7)	1.24 (0.50–3.07)	0.39	28 (4.4)	20 (3.7)	1.15 (0.61–2.16)	0.82
High school degree	69 (34.3)	207 (37.9)	1 (Ref.)		248 (38.7)	207 (37.9)	1 (Ref.)	
Some college	63 (31.3)	138 (25.3)	1.43 (0.92–2.22)		181 (28.2)	138 (25.3)	1.01 (0.75–1.36)	
College degree	60 (29.9)	181 (33.1)	1.01 (0.64–1.57)		184 (28.7)	181 (33.1)	0.78 (0.58–1.04)	
Income								
≤$30,000	43 (21.4)	101 (18.5)	1 (Ref.)	0.36	125 (19.5)	101 (18.5)	1 (Ref.)	0.07
$30,001–50,000	80 (39.8)	175 (32.1)	0.93 (0.55–1.57)		208 (32.5)	175 (32.1)	0.82 (0.55–1.21)	
$50,001–100,000	60 (29.8)	200 (36.6)	0.77 (0.42–1.40)		241 (37.6)	200 (36.6)	1.31 (0.53–1.10)	
≥$100,001	18 (9.0)	70 (12.8)	0.69 (0.35–1.37)		67 (10.4)	70 (12.8)	**0.63 (0.40–0.99)**	

[a]Adjusted for age at diagnosis, number of comorbidities, time between interviews, and year of diagnosis. Bold indicates confidence intervals that exclude 1 and *P* values <0.05.

drinking than women with a high school degree (OR, 0.38; 95% CI, 0.17–0.85 for some college; OR, 0.34; 95% CI, 0.15–0.80 for college degree; Table 4). Income and partnership status were not significantly associated with changing alcohol consumption behavior after diagnosis.

No significant associations between partnership status and SES with the likelihood of smoking cessation or starting smoking were observed (Table 5). Few women started smoking after diagnosis.

Discussion

In this study, we found that having higher educational attainment and high income, but not living with a partner, were associated with a positive change in health behaviors after a DCIS diagnosis. Women with higher SES characteristics (household income, education) were less likely to gain significant weight or stop physical activity after DCIS diagnosis. Women with higher SES were less likely to start drinking after DCIS diagnosis. These results speak to the importance of considering SES when determining which women after DCIS diagnosis are at risk for a change in health behavior.

Research on partnership status and change in health behavior after a diagnosis of *in situ* or invasive breast cancer is sparse. Recent studies have established that a state of heightened distress, including anxiety, depression, and psychosocial issues exist even years after an initial DCIS diagnosis (19–22). Liu and colleagues (23) observed that being married or partnered provided social support and intimate relationships that could allay a patient's concerns and minimize the perceived risk of recurrence. The LACE study concluded that support within the family strongly influenced prolonging survival of breast cancer patients (24). Also, Dawood and colleagues (25) showed that being married at the time of diagnosis of breast cancer improves survival regardless of patient and tumor characteristics. Though these studies have suggested that social networks and marital status enhance survival rates, the influence of partnership status on specific health behaviors after a breast cancer diagnosis has yet to be demonstrated. Our study did not support that living with a partner had a positive impact on change in health behaviors after a DCIS diagnosis, but these findings do not rule out beneficial impacts of partners for treatment adherence and maintaining healthy lifestyles.

Sprague and colleagues (26) previously demonstrated a decline in invasive breast cancer incidence in women with high SES. A

Table 3. Multivariable association between partnership status, income, and education at baseline and change in physical activity from 1 year prediagnosis to the earliest recontact ($N = 1{,}382$): WISC 1997–2011

	Stopped activity "cases" *N* (%)	Consistently active "controls" *N* (%)	OR[a] (95% CI)	Overall *P* value	Started activity "cases" *N* (%)	Consistently sedentary "controls" *N* (%)	OR[a] (95% CI)	Overall *P* value
Partnership status								
Not living with a partner	63 (17.0)	90 (14.1)	1 (Ref)	0.60	19 (17.9)	54 (20.4)	1 (Ref)	0.93
Living with a partner	308 (83.0)	550 (85.9)	0.90 (0.62–1.31)		87 (82.1)	211 (79.6)	1.03 (0.55–1.90)	
Education								
No high school degree	16 (4.3)	13 (2.1)	1.29 (0.57–2.92)	**0.01**	4 (3.8)	24 (9.1)	0.39 (0.12–1.25)	0.28
High school degree	159 (42.9)	189 (29.5)	1 (Ref)		50 (47.2)	123 (46.4)	1 (Ref)	
Some college	105 (28.3)	187 (29.2)	**0.69 (0.50–0.96)**		27 (25.5)	61 (23.0)	1.01 (0.55–1.84)	
College degree	91 (24.5)	251 (39.2)	**0.45 (0.32–0.63)**		25 (23.6)	57 (21.5)	0.99 (0.54–1.80)	
Income								
≤$30,000	92 (14.4)	79 (21.3)	1 (Ref)	0.09	25 (23.6)	73 (27.6)	1 (Ref)	0.63
$30,001–50,000	186 (29.1)	132 (35.6)	0.87 (0.57–1.33)		43 (40.6)	97 (36.6)	1.21 (0.58–1.48)	
$50,001–100,000	274 (42.8)	118 (31.8)	**0.62 (0.39–0.97)**		29 (27.4)	79 (29.8)	0.90 (0.42–1.91)	
≥$100,001	88 (13.7)	42 (11.3)	0.66 (0.39–1.11)		9 (8.5)	16 (6.0)	1.48 (0.55–4.01)	

[a]Adjusted for age at diagnosis, number of comorbidities, time between interviews, and year of diagnosis. Bold indicates confidence intervals that exclude 1 and *P* values <0.05.

Table 4. Multivariable association between partnership status, income, and education at baseline and change in alcohol intake from 1 year prediagnosis to the earliest recontact ($N = 1{,}382$): WISC 1997–2011

	Stopped drinking "cases" *N* (%)	Consistent drinker "controls" *N* (%)	OR[a] (95% CI)	Overall *P* value	Started drinking "cases" *N* (%)	Consistent non-drinker "controls" *N* (%)	OR[a] (95% CI)	Overall *P* value
Partnership status								
Not living with a partner	19 (22.4)	159 (15.0)	1 (Ref)	0.26	8 (12.7)	40 (23.1)	1 (Ref)	0.10
Living with a partner	66 (77.6)	902 (85.0)	0.73 (0.42–1.27)		55 (87.3)	133 (76.9)	2.07 (0.88–1.59)	
Education								
No high school degree	7 (8.2)	31 (2.9)	**2.70 (1.06–6.91)**	0.09	2 (3.2)	17 (9.8)	0.26 (0.05–1.24)	**<0.01**
High school degree	28 (32.9)	391 (36.9)	1 (Ref)		37 (28.7)	65 (37.6)	1 (Ref)	
Some college	23 (27.1)	296 (27.9)	1.15 (0.64–2.07)		13 (20.6)	48 (27.7)	**0.38 (0.17–0.85)**	
College degree	27 (31.8)	343 (32.3)	1.19 (0.68–2.09)		11 (17.5)	43 (24.9)	**0.34 (0.15–0.80)**	
Income								
≤$30,000	21 (24.7)	175 (16.5)	1 (Ref)	0.26	15 (23.8)	58 (33.5)	1 (Ref)	0.66
$30,001–50,000	31 (36.5)	345 (32.5)	0.95 (0.46–1.95)		27 (42.9)	55 (31.8)	1.88 (0.78–4.55)	
$50,001–100,000	29 (34.1)	405 (38.2)	0.77 (0.38–1.56)		19 (30.1)	47 (27.2)	1.59 (0.62–4.03)	
≥$100,001	4 (4.7)	136 (12.8)	0.42 (0.13–1.33)		2 (3.2)	13 (7.5)	0.64 (0.11–3.76)	

[a]Adjusted for age at diagnosis, number of comorbidities, time between interviews, and year of diagnosis. Bold indicates confidence intervals that exclude 1 and *P* values <0.05.

prior study suggested that women with low income are more likely to be depressed or anxious compared with higher income groups (27). Financial hardships can be exacerbated by the stress of a major event, which can potentially worsen depression and negatively influence health behaviors (28, 29). Furthermore, DCIS women with higher SES may have a better opportunity and flexibility to modulate lifestyle behaviors in accordance with their health needs, unlike women with lower income or education. Finally, financial discomfort and less education have been associated with heightened perceived risks, which have the potential to negatively influence behavior change (30). In aggregate, our results support the need to intervene and mitigate negative changes in behavior, and focus these efforts on lower SES DCIS patients who are most susceptible.

Associations in the present study were adjusted for comorbidity burden. It is possible that individuals with comorbidities present to health care providers more often and are more likely to hear a message about behavior change regardless of their SES or partnership status. Moreover, it has been previously demonstrated that patients with lower SES tend to develop comorbidities at younger ages along with a higher prevalence of mental health problems, compounding challenges to adopt positive health behaviors (31). Research on effective interventions to improve outcomes in patients with multiple comorbid conditions is limited, and the extent to which SES influences intervention effectiveness is unknown (32). Comorbidities may also influence a person's physical functioning and attitudes toward their health behavior. Future research is recommended that focuses on subgroups defined by comorbidity burden.

This study has certain limitations and strengths. First, the WISC cohort predominately includes non-Hispanic women of European descent, whereby the study could not analyze differences by race/ethnicity. Second, both telephone interviews and follow-up questionnaires were dependent upon participants' self-reporting, and prediagnosis behaviors were recalled at baseline, which occurred at an average of 1.3 years after diagnosis. Although self-reported behaviors tend to be recalled with adequate reliability (33), prior studies suggest that the accuracy of recalled factors, including body weight and smoking may vary based on SES (34, 35). Changes in SES during follow-up, although uncommon, were also not accounted for in the analysis. Any resulting

Table 5. Multivariable association between partnership status, income, and education at baseline and change in smoking status from 1 year prediagnosis to the earliest recontact ($N = 1{,}382$): WISC 1997–2011

	Stopped smoking "cases" *N* (%)	Consistent smoker "controls" *N* (%)	OR[a] (95% CI)	Overall *P* value	Started smoking "cases" *N* (%)	Consistent non-smoker "controls" *N* (%)	OR[a] (95% CI)	Overall *P* value
Partnership status								
Not living with a partner	20 (23.8)	29 (26.1)	1 (Ref.)	0.28	3 (33.3)	174 (14.8)	1 (Ref.)	0.14
Living with a partner	64 (76.2)	82 (73.9)	1.50 (0.72–1.14)		6 (66.7)	1004 (85.2)	0.33 (0.08–1.42)	
Education								
No high school degree	4 (4.8)	8 (7.2)	0.55 (0.13–2.34)	0.94	1 (11.1)	44 (3.7)	2.14 (0.22–21.0)	0.34
High school degree	37 (44.0)	49 (44.1)	1 (Ref.)		5 (55.6)	430 (36.5)	1 (Ref.)	
Some college	22 (26.2)	40 (36.0)	0.83 (0.40–1.69)		1 (11.1)	317 (26.9)	0.20 (0.02–1.73)	
College degree	21 (25.0)	14 (12.6)	2.03 (0.86–4.77)		2 (22.2)	387 (32.9)	0.30 (0.05–1.72)	
Income								
≤$30,000	24 (28.6)	27 (24.3)	1 (Ref.)	0.64	3 (33.3)	215 (18.2)	1 (Ref.)	0.95
$30,001–50,000	28 (33.3)	47 (42.3)	0.83 (0.33–2.05)		4 (44.4)	379 (32.2)	1.74 (0.38–8.08)	
$50,001–100,000	28 (33.3)	31 (27.9)	1.70 (0.61–4.78)		2 (22.2)	439 (37.3)	0.52 (0.08–3.37)	
≥$100,001	4 (4.8)	6 (5.4)	1.38 (0.32–6.03)		0	145 (12.3)	—[b] (—[b])	

[a]Adjusted for age at diagnosis, time between interviews, and year of diagnosis.
[b]OR not estimated.

nondifferential misclassification would, therefore, be expected to attenuate our observed associations and result in underestimation of the associations between SES and change in health behaviors. Small samples sizes especially in some behavior–SES subgroups limited ability to detect modest associations. Finally, though major comorbidities like CVD, heart failure, stroke, and COPD etc., were taken into account and the list of comorbidities based on the Charlson index is well established, the list is not necessarily exhaustive. Importantly, a major strength of the study is that the cohort was designed to assess DCIS patient behavior and outcomes so that data were collected uniformly multiple times.

In this study, SES but not partnership status was associated with change in health behaviors among women diagnosed with DCIS. These key behaviors included sedentary lifestyle, decrease in physical activity, weight gain, alcohol consumption, and smoking. Future research should be undertaken to further enhance our understanding of these relationships for DCIS patients and assess the effectiveness of interventions targeted to higher risk subgroups.

Disclosure of Potential Conflicts of Interest

No potential conflicts of interest were disclosed.

Authors' Contributions

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