

HEALTH BEHAVIORS AND BREAST CANCER RISK IN NON-HISPANIC WHITE & HISPANIC WOMEN

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Purpose

Approximately a third of breast cancer incidence is related to lifestyle choices, and the risk for developing the disease varies among ethnicities [1]. Cigarette smoking, alcohol consumption, body size and shape, physical activity, and diet are all modifiable factors associated with breast cancer risk [1-3]. However, not much is known of the combined effects of the risk factors. Some epidemiological studies suggest that a combination of unhealthy risk factors is associated with increased cancer risk [4-6]. There is also little information on minority populations. This study developed a healthy behavior index (HBI) and compared its association with breast cancer risk in non-Hispanic white (NHW) and Hispanic (H) women.

The main objective was to discover if the healthy behavior index is associated with breast cancer risk by case-control status and race. It has not been discovered yet why there is a difference between NHW and H women and their risks for developing breast cancer.

Methods {Study Population}

New Mexico Site of 4-Corners Women's Health Study (1999-2005)

Study Objective	■ To evaluate the association between combined modifiable factors and breast cancer risk in non-Hispanic white and Hispanic women.
Case Eligibility Criteria and Ascertainment	■ Hispanic, Native American or NHW ethnicity (self-reported) ■ resident of New Mexico ■ age 25-79 years ■ diagnosed with a 1st primary breast cancer between 10/1999 and 05/2004 ■ ascertained from state cancer registry (SEER)
Control Eligibility Criteria and Ascertainment	■ women <65 years randomly selected from driver's license lists ■ women ≥65 years selected from Center for Medicare Services list ■ frequency-matched to cases (5-year age distribution & ethnicity)
HBI Sample Size	■ Cases = 982 (NHW = 635; H = 347) ■ Controls = 919 (NHW=604; H = 315)

Methods {HBI Construction}

Construction of the Healthy Behavior Index

HBI Variables	Definitions
Smoking	0 = never smoker; 1 = former; 2 = current
Alcohol Consumption*	0 ≤ ½ standard drink/day; 1 = ≤ 1 standard drink/day; 2 = ≥ standard drink/day
Body Mass Index (BMI)*	0 = normal (<25 kg/m ²); 1 = overweight (25-30 kg/m ²); 2 = obese (>30 kg/m ²)
Waist-Hip Ratio (WHR)	0 = T1; 1 = T2; 2 = T3
Diet Pattern**	0 = Q1; 1 = Q2; 2 = Q3; 3 = Q4
Vigorous Physical activity	0 = >75 min/wk; 1 = ≤75 min/wk; 2 = no PA
Healthy Behavior Index***	Range 0-13; Q1 = 0-3; Q2 = 4-5; Q3 = 6-7; Q4 = 8-13

*based on American Cancer Society cancer prevention guidelines

**Based on Murtaugh et al. (2007). Diet pattern reflects a diet high in eggs, cheese, corn, fresh tomato-based products, beans, chicken, and low in refined grains, snacks, beef, and fast food.

***Categorization of the HBI is based on distribution of controls.

T = Tertiles; Q = Quartiles

Data on modifiable behavioral factors were collected via in-person interviews for the year prior to

Methods {Statistical Analysis}

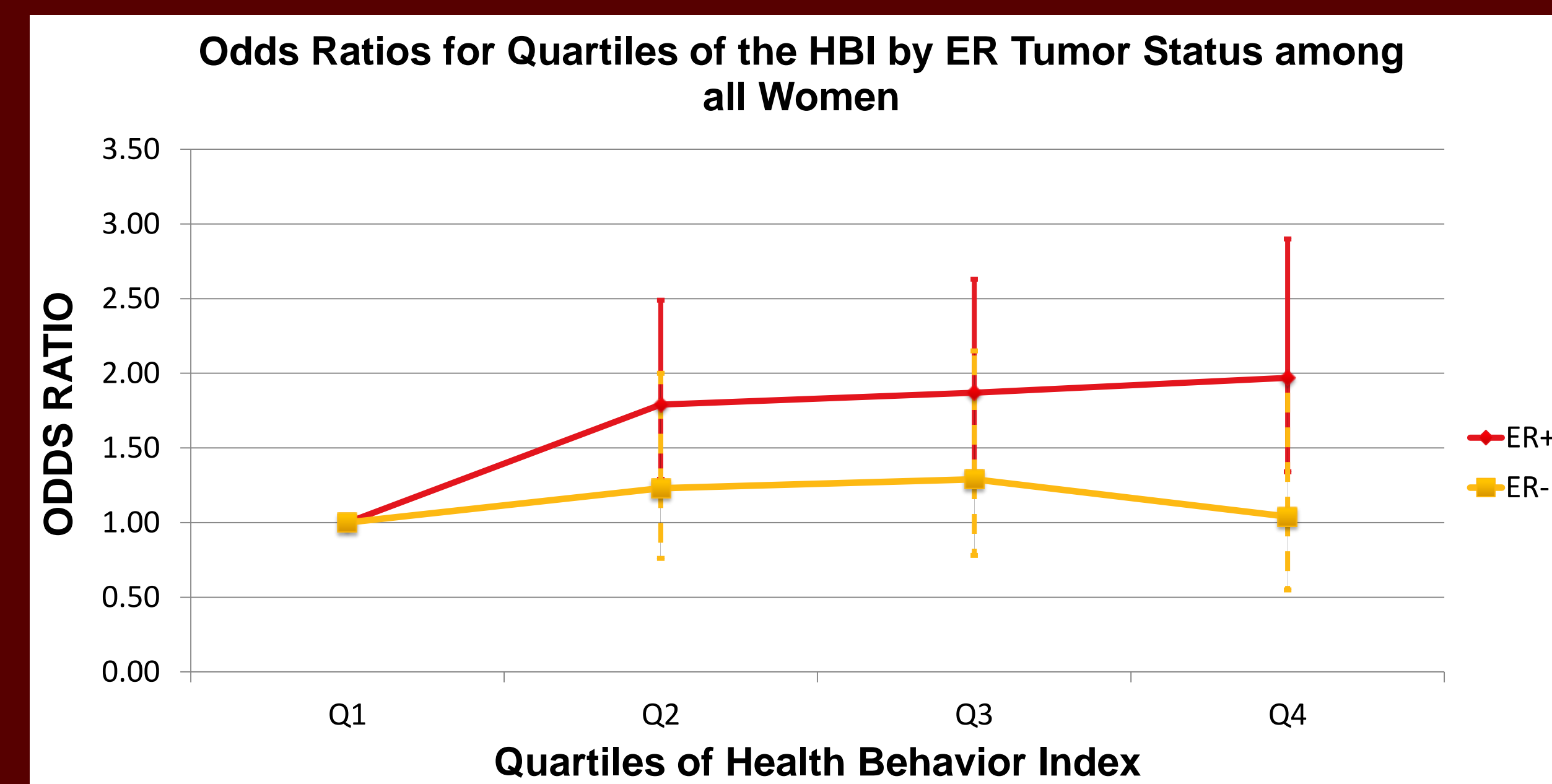
Using SAS Version 9.4 (Cary, NC):

Descriptive characteristics were compared using chi-square (X²) for significance stratified by case-control status and ethnicity. Associations between healthy behavior index scores and breast cancer risk were calculated with multivariable logistic regression to estimate odds ratios (ORs) with 95% confidence intervals between cases and controls. Multinomial logistic regression determined associations between HBI and risk of breast cancer defined by ER status, compared to controls.

Results

Table 1. Description and Prevalences of the Healthy Behavior Index Factors (n=1901)

	All women			Non-Hispanic White			Hispanic		
	Case (n=982)	Control (n=919)	p-value ¹	Case (n=635)	Control (n=604)	p-value ²	Case (n=347)	Control (n=315)	p-value ³
Age (Mean ± SD)	55.4 ±11.5 n (%)	55.4 ±11.0 n (%)	0.93	56.7 ±11.6 n (%)	56.5 ±11.1 n (%)	0.20	53.0 ±10.9 n (%)	53.2 ±10.6 n (%)	0.56
Menopausal Status			0.46			0.67			0.53
Premenopausal	345 (35.1)	308 (33.5)		209 (32.9)	192 (31.8)		136 (39.2)	116 (36.8)	
Postmenopausal	637 (64.9)	611 (66.5)		426 (67.1)	412 (68.2)		211 (60.8)	199 (63.2)	
Education			0.16			0.93			0.09
<Highschool	642 (65.4)	611 (66.5)		486 (76.5)	459 (76.0)		156 (45.0)	152 (48.3)	
Highschool	226 (23.0)	231 (25.1)		124 (19.5)	126 (20.9)		102 (29.4)	105 (33.3)	
>Highschool	114 (11.6)	77 (8.4)		25 (3.9)	19 (3.2)		89 (25.7)	58 (18.4)	
Cigarette Smoking Status			0.97			0.47			0.31
Never	547 (55.7)	522 (56.8)		322 (50.7)	324 (53.6)		225 (64.8)	198 (62.9)	
Current	288 (29.3)	248 (27.0)		207 (32.6)	180 (29.8)		180 (51.8)	68 (21.6)	
Former	147 (15.0)	149 (16.2)		106 (16.7)	100 (16.6)		41 (11.8)	49 (15.6)	
Alcohol Consumption			0.32			0.06			0.25
Non-drinker	803 (81.8)	775 (84.3)		488 (76.9)	495 (81.6)		315 (90.8)	280 (88.9)	
1 Drink/day	90 (9.2)	63 (6.9)		75 (11.8)	52 (8.6)		15 (4.3)	11 (3.5)	
1+ Drink/day	89 (9.1)	81 (8.8)		72 (11.3)	57 (9.4)		17 (4.9)	24 (7.6)	
Body Mass Index (kg/m ²)			0.23			0.60			0.15
<25	432 (44.0)	392 (42.7)		304 (47.9)	295 (48.8)		128 (36.9)	97 (30.8)	
25.0-29.99	329 (33.5)	292 (31.8)		210 (33.1)	174 (28.8)		119 (34.3)	118 (37.5)	
30+	221 (22.5)	235 (25.6)		121 (19.1)	135 (23.4)		100 (28.8)	100 (31.8)	
Waist-Hip Circumference (cm)			0.04			0.07			0.36
<0.775	273 (27.8)	301 (32.8)		202 (31.8)	234 (38.7)		71 (20.5)	67 (21.3)	
0.775-0.84	352 (35.9)	309 (33.6)		241 (38.0)	196 (32.5)		111 (32.0)	113 (35.9)	
0.84+	357 (36.4)	309 (33.6)		192 (30.2)	174 (28.8)		165 (47.6)	135 (42.9)	
Vigorous Physical Activity			0.16			0.14			0.79
No Activity	250 (25.5)	253 (27.5)		173 (27.2)	180 (29.8)		77 (22.2)	73 (23.2)	
≤75 min/week	305 (31.1)	295 (32.1)		207 (32.6)	207 (34.3)		98 (28.2)	88 (27.9)	
>75 min/week	427 (43.5)	371 (40.4)		255 (40.2)	217 (35.9)		172 (49.6)	154 (48.9)	
Diet Pattern			0.01			0.002			0.24
Q1	224 (22.8)	246 (26.8)		56 (8.8)	85 (14.1)		168 (48.4)	161 (51.1)	
Q2	241 (24.5)	236 (25.7)		134 (21.1)	136 (22.5)		107 (30.8)	100 (31.8)	
Q3	256 (26.1)	230 (25.0)		202 (31.8)	187 (31.0)		54 (15.6)	43 (13.7)	
Q4	261 (26.6)	207 (22.5)		243 (38.3)	196 (32.5)		18 (5.2)	11 (3.5)	
Estrogen Receptor Status									0.01
ER+	497 (77.7)	--		334 (80.7)	--		163 (72.1)	--	
ER-	143 (22.3)	--		80 (19.3)	--		63 (27.9)	--	



Results

Table 2. Associations between individual HBI components, the HBI, and breast cancer risk stratified by ethnicity

HBI Components	All Women		Non-Hispanic White Women				Hispanic Women					
	Crude OR	95% CI	Adjusted* OR	95% CI	Crude OR	95% CI	Adjusted* OR	95% CI	Crude OR	95% CI	Adjusted* OR	95% CI
Cigarette Smoking Status												
Never	1.00		1.00		1.00		1.00		1.00		1.00	
Former	1.11	0.90-1.36	1.13	0.92-1.39	1.16	0.90-1.49	1.16	0.90-1.49	1.05	0.72-1.52	1.08	0.74-1.58
Current	0.94	0.73-1.22	0.95	0.73-1.23	1.07	0.78-1.46	1.06	0.77-1.46	0.74	0.47-1.16	0.76	0.48-1.20
Alcohol Consumption												
Non-drinker	1.00		1.00		1.00		1.00		1.00		1.00	
1 Drink/day	1.38	0.99-1.93	1.41	1.01-1.98	1.46	1.01-2.13	1.47	1.01-2.14	1.21	0.54-2.68	1.25	0.56-2.78
1+ Drink/day	1.06	0.77-1.46	1.08	0.78-1.48	1.28	0.89-1.85	1.28	0.88-1.85	0.63	0.33-1.20	0.66	0.34-1.25
Body Mass Index (kg/m²)												
<25	1.00		1.00		1.00		1.00		1.00		1.00	
25.0-29.99	1.02	0.83-1.26	1.02	0.82-1.26	1.17	0.91-1.51	1.18	0.91-1.52	0.76	0.53-1.10	0.76	0.52-1.10
30+	0.85	0.68-1.07	0.83	0.66-1.05	0.87	0.65-1.17	0.87	0.65-1.18	0.76	0.52-1.11	0.72	0.49-1.06
Waist-Hip Circumference (cm)												
<0.775	1.00		1.00		1.00		1.00		1.00		1.00	
0.775-0.84	1.26	1.00-1.57	1.27	1.01-1.60	1.42	1.09-1.86	1.46	1.12-1.92	0.927	0.61-1.42	0.92	0.60-1.40
0.84+	1.27	1.02-1.59	1.27	1.01-1.59	1.28	0.97-1.69	1.322	0.99-1.76	1.15	0.77-1.73	1.09	0.72-1.65
Vigorous Physical Activity												
No Activity	1.00		1.00		1.00		1.00		1.00		1.00	
≤75 min/week	1.05	0.83-1.33	1.05	0.83-1.33	1.04	0.78-1.38	1.05	0.79-1.39	1.06	0.69-1.62	1.06	0.68-1.63
>75 min/week	1.17	0.93-1.46	1.16	0.92-1.45	1.22	0.93-1.61	1.25	0.94-1.65	1.06	0.72-1.56	1.01	0.68-1.50
Diet Pattern												
Q1	1.00		1.00		1.00		1.00		1.00		1.00	
Q2	1.12	0.87-1.45	1.22	0.94-1.58	1.50	0.99-2.26	1.49	0.98-2.25	1.03	0.72-1.45	1.14	0.80-1.64
Q3	1.22	0.95-1.58	1.35	1.04-1.76	1.64	1.11-2.43	1.64	1.11-2.43	1.20	0.76-1.90	1.36	0.85-2.17
Q4	1.39	1.07-1.79	1.56	1.19-2.22	1.88	1.28-2.77	1.90	1.29-2.80	1.57	0.72-3.42	1.81	0.82-4.01
HBI												
Q1	1.00		1.00		1.00		1.00		1.00		1.00	
Q2	1.47	1.14-1.90	1.48	1.14-1.91	1.96	1.40-2.75	2.00	1.42-2.81	1.00	0.70-1.48	0.98	0.65-1.46
Q3	1.55	1.19-2.02	1.58	1.21-2.06	2.01	1.42-2.84	2.10	1.47-2.98	1.10	0.73-1.68	1.07	0.70-1.64
Q4	1.52	1.12-2.06	1.59	1.17-2.17	2.04	1.41-2.96	2.16	1.47-3.16	0.93	0.51-1.69	0.96	0.52-1.76
p-trend		0.0055		0.003		0.0008		0.0004		0.88		0.88

*Adjusted for education and menopausal status

P-interaction is significant P=0.0376

Conclusions

- The HBI was associated with breast cancer risk.
- The association is stronger in non-Hispanic white women, and in women with estrogen receptor positive tumor phenotypes.
- The direction of the association suggests that women with multiple unhealthy behaviors, including drinking, smoking, a poor diet, a high BMI and WHR, are at greater risk for developing breast cancer.
- Future research may be directed at refining the HBI in replicating these findings in a larger study.
- A policy implication is that a reduction of multiple rather than single risk factors should be addressed in primary interventions.
- Inclusion of risk biomarkers in conjunction with HBI could provide a more sensitive tool for cancer prevention.

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Acknowledgements:
Research supported by: National Institutes of Health Contract for New Mexico site (R01-CA-078762), National Cancer Institute for funding (R25-CA1342