

Overall and central adiposity and risk of contralateral breast cancer: The California Breast Cancer Survivorship Consortium

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Supplementary Table 1. Summary of studies on associations of BMI, weight, weight gain, and height with risk of second primary breast cancer

Meta-analyses						
Study			Study design	Type of second primary breast cancer event	RR for BMI (per 5 kg/m ²)	RR for BMI categories
Chan 2023 [1]			Meta-analysis	CBC	8 studies 1.14 (1.04-1.26)	
Akdeniz 2020 [2]			Meta-analysis	CBC		5 studies ≥25 vs. <25: 1.22 (1.01-1.47) 4 studies 25-29 vs. <25: 1.13 (0.85-1.49) 3 studies ≥30 vs. <25: 1.23 (0.88-1.72)
Druesne-Pecollo 2012 [3]			Meta-analysis	CBC	7 studies 1.12 (1.06-1.20) 8 studies 1.14 (1.07-1.21)	8 studies 25-29 vs. <25: 1.09 (0.95-1.25) ≥30 vs. <25: 1.37 (1.20-1.57) 9 studies 25-29 vs. <25: 1.14 (0.98-1.32) ≥30 vs. <25: 1.40 (1.24-1.58)
Cohort Studies						
Study	Inclusion in meta-analysis	FBC	Study design; Source of study sample; # cohort members; # SBC; # controls.	Type of second breast cancer event	RR for BMI (per 5 kg/m ²)	RR for categories of BMI, weight, weight gain, or height
Ramin 2021 [4]			Cohort study; NIH-AARP cohort; 10,934 postmenopausal stage 0-III FBC; 436 CBC.	In situ or invasive CBC		All FBC: 25-29 vs. <25: 1.20 (0.92-1.55) ≥30 vs. <25: 1.14 (0.92-1.44) p trend=0.12 Invasive FBC: ≥30 vs. <25: 1.14 (0.85-1.53) Invasive ER+ FBC: ≥30 vs. <25: 1.28 (0.82-2.00)

Feigelson 2021 [5]			Cohort study; Kaiser health plan members; 6481 stage I-III invasive FBC; 333 SBC; 231 ER+ SBC.	CBC or IBC ER+ FBC	<i>All SBC</i> 1.11 (1.02-1.21) <i>Postmenopausal:</i> 1.11 (0.99-1.24) <i>ER+ SBC</i> 1.15 (1.04-1.27) <i>Postmenopausal:</i> 1.14 (1.00-1.29)	
Ricceri 2015 [6]			Cohort study; EPIC Cohort; 7289 invasive FBC; 121 CBC.	CBC		≥30 vs. <25: 1.65 (0.95-2.87), p-trend=0.09
Majed 2011 [7]	a, b, c		Cohort study; Patients Curie Institute; 15,166 invasive stage I-III FBC; 1,370 CBC.	Contralateral recurrence	1.11 (1.01-1.21)	<i>All FBC:</i> ≥30 vs. <30: 1.19 (0.97-1.47) ≥25 vs. <25: 1.21 (1.07-1.36) <i>0-<10 y follow-up:</i> ≥30 vs. <30: 1.07 (0.84-1.38) ≥25 vs. <25: 1.21 (1.07-1.36) <i>10-24 y follow-up:</i> ≥30 vs. <30: 1.60 (1.10-2.34) ≥25 vs. <25: 1.50 (1.21-1.86)
Trentham-Dietz 2007 [8]	b, c		Cohort study; Wisconsin tumor registry; 8,020 postmenopausal invasive FBC; 488 SBC.	CBC or IBC		<i>Postmenopausal:</i> BMI Q4 vs Q1: 1.56 (1.13-2.16) p-trend=0.003 Weight gain Q4 vs Q1: 1.63 (1.03-2.60) p-trend=0.02 Height: no association
Dignam 2006 [9]	a, b, c	ER- and node-	Cohort study; Clinical trial cohort; 4077 FBC; 772 recurrences; 242 CBC.	Recurrence (at any anatomic site) CBC	1.10 (0.96-1.25)	Recurrence: no association CBC: <i>Postmenopausal:</i> ≥30 vs. <25: 2.08 (1.22-3.55) <i>Premenopausal:</i> no association
Dignam 2003 [10]	a, b, c	ER+ and node -	Cohort study; Clinical trial cohort; 3385 FBC; 787 recurrences;	Recurrence (at any local, regional, distant site)	1.25 (1.05-1.50)	Recurrence: no association regardless of menopausal status CBC: ≥30 vs. <25: 1.58 (1.10-2.25)

			193 CBC.	CBC		<i>Premenopausal:</i> ≥30 vs. <25: 1.52 (0.77-3.03) <i>Postmenopausal:</i> ≥30 vs. <25: 1.63 (1.07-2.51)
Li 2003 [11]	^c	≤45 y	Population-based cohort; 1285 invasive FBC; 77 CBC.	Invasive CBC		BMI ≥30 vs. <25: 2.6 (1.1-5.9) Weight Q4 vs Q1: 2.2 (1.1-4.4)
Case-control studies						
Flanagan 2018 [12]	^a	DCIS	Population-based nested case-control; Seattle-Puget Sound cancer registry; 4157 FBC with DCIS; 448 SBC; 862 controls.	Invasive or in situ CBC or IBC	1.46 (1.18-1.81)	<i>BMI at FBC:</i> Invasive SBC: ≥30 vs. <25: 1.8 (1.2-2.6) CBC: ≥30 vs. <25: 2.2 (1.4-3.3) <i>BMI at SBC:</i> Invasive SBC: ≥30 vs. <25: 1.6 (1.1-2.3) CBC: ≥30 vs. <25: 1.9 (1.3-2.8) Invasive SBC or CBC: No associations with BMI gain or weight gain
Brooks 2016 [13] Brooks 2012 [14]	^{a, b}		Population-based case-control; From 5 cancer registries; 1386 CBC; 2045 stage I-III controls.	Invasive or in situ CBC	0.94 (0.83-1.06)	<i>Premenopausal to postmenopausal:</i> ≥10 kg weight gain: 1.4 (1.01-1.9) <i>Premenopausal to postmenopausal and ER-negative:</i> ≥30 vs. <25: 1.9 (1.02-3.4) <i>Premenopausal to postmenopausal and ER-negative:</i> ≥10 kg weight gain: 1.9 (0.99-3.8)
Li 2009 [15]	^{a, c}	ER+ FBC	Population-based nested case-control; Western Washington cancer registry; 17,628 stage I-III ER+ FBC; 365 CBC; 726 controls.	Invasive CBC	1.23 (1.02-1.48)	<i>At FBC:</i> ≥30 vs. <25: 1.5 (1.0-2.1) <i>At reference year:</i> ≥30 vs. <25: 1.4 (1.0-2.1)

Cook 1996 [16]	a, c		Population-based nested case-control; Western Washington state cancer registry; 12,598 stage I-III FBC; 216 CBC; 424 controls.	In situ or invasive CBC	0.97 (0.78-1.20)	<i>Premenopausal:</i> ≥30 vs. <25: 2.25 (0.93-5.42) <i>Postmenopausal:</i> ≥30 vs. <25: 0.61 (0.29-1.27) <i>All:</i> ≥30 vs. <25: 0.98 (0.57-1.69)
Storm 1992 [17]	a, c		Population-based nested case-control; Danish Cancer Registry; 56,540 invasive FBC; 529 CBC; 529 controls.	CBC	1.34 (1.04-1.26)	≥30 vs. <25: 1.77 (1.00-3.14)

Abbreviations. BMI, body mass index; CBC, contralateral second primary breast cancer; DCIS, ductal carcinoma in situ; EPIC, European Prospective Investigation into Cancer and Nutrition; ER-, estrogen receptor-negative; ER+, estrogen receptor-positive; FBC, first primary breast cancer; IBC, ipsilateral second primary breast cancer; NIH-AARP, National Institutes of Health – American Association of Retired Persons; SBC, second primary breast cancer; Q, quartile; RR, relative risk.

^a Included in meta-analysis by Chan et al. 2023 [1].

^b Included in meta-analysis by Akdeniz et al. 2020 [2].

^c Included in meta-analysis by Druesne-Pecollo et al. 2012 [3]

Supplementary Table 2. Description of the studies included in the pooled analysis

Study	Design	Location	Race and ethnicity	Baseline data collection	Year of invasive FBC diagnosis	Age at invasive FBC diagnosis	Number of FBC ^a	Number of CBC ^b
AABCS ^c	Case-control	Los Angeles County	Chinese, Filipina, Japanese	In-person interview	1995-2001 2003-2006	25-74	1,001	72
CARE ^d	Case-control	Los Angeles County	African American, NHW	In-person interview	1994-1998	35-64	1,062	93
SFBCS ^e	Case-control	San Francisco Bay Area	African American, Hispanic, NHW	In-person interview	1995-2002	35-79	1,881	121
NC-BCFR ^f	Family-based study	Primarily San Francisco Bay Area	All racial and ethnic groups ^g	In-person interview	1995-2009	18-64	2,405	149
LACE ^{h,i}	Survivor cohort	Primarily San Francisco Bay Area	All racial and ethnic groups	Mailed questionnaire	1997-2000	18-79	1,556	90
MEC ^{j,k}	Prospective general population cohort	Primarily Los Angeles County	African American, Hispanic, Japanese, NHW	Mailed questionnaire	1993-2007	45-75	1,574	85
Total							9,479	610

Abbreviations: AABCS, Asian American Breast Cancer Study; CARE, California component of the Women's Contraceptive and Reproductive Experiences Study; CBC, contralateral second primary invasive breast cancer; FBC, first primary invasive breast cancer; LACE, California component of the Life After Cancer Epidemiology Study; MEC, Multiethnic Cohort; NHW, non-Hispanic White; NC-BCFR, California component of the Breast Cancer Family Registry; SFBCS, San Francisco Bay Area Breast Cancer Study.

^a Women with FBC in analytic cohort, after excluding women with a prior primary cancer (n=664), bilateral breast cancer diagnosed on the same day (n=43), stage IV or unknown stage FBC (n=524), contralateral risk-reducing mastectomy at FBC diagnosis (n=168), self-identified race and ethnicity other than African American, Asian American, Hispanic, or NHW (n=66), or a second primary cancer or death in first 180 days of follow-up (n=165).

^b Number of CBC in FBC cases without a contralateral risk-reducing mastectomy at FBC diagnosis.

^c Asian American Breast Cancer Study (AABCS), a population-based case-control study [18].

^d California component of the Women's Contraceptive and Reproductive Experiences Study (CARE), a population-based case-control study [19].

^e San Francisco Bay Area Breast Cancer Study (SFBCS), a population-based case-control study [20].

^f California component of the Breast Cancer Family Registry (NC-BCFR), a population-based family study with a control component [21].

^g Oversampling of African American, Hispanic, Chinese, Filipina, and Japanese FBC cases.

^h California component of the Life After Cancer Epidemiology Study (LACE), a breast cancer survivor cohort [22].

ⁱ LACE also collected information on weight in the year before diagnosis.

^j California component of the Multiethnic Cohort (MEC), a prospective general population cohort [23].

^k Incident invasive FBC diagnosed from 1993-2007.

Supplementary Table 3. Distribution of body mass index and central adiposity, by race and ethnicity and menopausal status at diagnosis of first primary invasive breast cancer

	Overall		African American		Asian American		Hispanic		Non-Hispanic White	
	N	%	N	%	N	%	N	%	N	%
BMI^{a,b,c}	9,479	100	2,110	22	1,865	20	2,330	25	3,174	33
All FBC										
Normal weight	3,881	41	613	29	848	45	763	33	1,657	52
Overweight	3,101	33	704	33	726	39	788	34	883	28
Obesity	2,497	26	793	38	291	16	779	33	634	20
Mean BMI kg/m ² (SD)	26.8 (5.8)		29.0 (6.4)		23.9 (4.0)		28.2 (5.8)		26.0 (5.5)	
Premenopausal FBC ^d										
Normal weight	1,574	51	267	39	395	53	307	42	605	64
Overweight	885	29	193	28	263	35	230	32	199	21
Obesity	630	20	220	32	85	11	190	26	135	14
Mean BMI kg/m ² (SD)	25.6 (5.8)		27.9 (6.5)		23.3 (4.0)		27.1 (5.7)		24.7 (5.5)	
Postmenopausal FBC										
Normal weight	2,307	36	346	24	453	40	456	28	1,052	47
Overweight	2,216	35	511	36	463	41	558	35	684	31
Obesity	1,867	29	573	40	206	18	589	37	499	22
Mean BMI kg/m ² (SD)	27.4 (5.8)		29.5 (6.3)		24.3 (3.9)		28.6 (5.7)		26.6 (5.5)	
WC (cm, tertiles)^{e,f}	2,760	100	390	14	956	35	962	35	452	16
All FBC										
<78.8	915	33	35	9	506	53	210	22	164	36
78.8-<91.6	923	33	120	31	325	34	323	34	155	34
≥91.6	922	33	235	60	125	13	429	45	133	29
Mean WC (SD)	86.9 (14.1)		96.6 (14.2)		80.1 (10.3)		90.6 (13.9)		85.1 (14.1)	
Premenopausal FBC ^d										
<78.8	492	42	18	12	269	61	128	31	77	49
78.8-<91.6	364	31	51	34	131	30	137	33	45	29
≥91.6	310	27	83	55	40	9	153	37	34	22
Mean WC (SD)	84.3 (14.0)		94.2 (13.9)		78.3 (9.9)		87.9 (14.0)		82.3 (15.5)	
Postmenopausal FBC										
<78.8	423	27	17	7	237	46	82	15	87	29
78.8-<91.6	559	35	69	29	194	38	186	34	110	37
≥91.6	612	38	152	64	85	16	276	51	99	33
Mean WC (SD)	88.9 (13.9)		98.2 (14.1)		81.7 (10.3)		92.8 (13.5)		86.7 (13.1)	
WHtR^{e,g}										
All FBC	2,760		390		956		962		452	
≤0.5	942	34	55	14	488	51	198	21	201	44
>0.5 - 0.6	1,093	40	167	43	372	39	388	40	166	37
>0.6	725	26	168	43	96	10	376	39	85	19
Mean WHtR (SD) ^h	0.55 (0.09)		0.59 (0.09)		0.51 (0.07)		0.58 (0.09)		0.52 (0.09)	
Premenopausal FBC ^d	1,166		152		440		418		156	

≤0.5	514	44	34	22	267	61	122	29	91	58
>0.5 - 0.6	420	36	66	43	144	33	167	40	43	28
>0.6	232	20	52	34	29	7	129	31	22	14
Mean WHtR (SD) ⁱ	0.53 (0.09)		0.57 (0.09)		0.50 (0.06)		0.56 (0.09)		0.50 (0.09)	
Postmenopausal FBC	1,594		238		516		544		296	
≤0.5	428	27	21	9	221	43	76	14	110	37
>0.5 - 0.6	673	42	101	42	228	44	221	41	123	42
>0.6	493	31	116	49	67	13	247	45	63	21
Mean WHtR (SD) ^j	0.56 (0.09)		0.60 (0.09)		0.52 (0.07)		0.60 (0.09)		0.54 (0.08)	
Body roundness index ^{e,k}										
All FBC	2,760		390		956		962		452	
<3.35	909	33	55	14	458	48	195	20	201	44
3.35-<4.98	927	34	132	34	343	36	315	33	137	30
≥4.98	924	33	203	52	155	16	452	47	114	25
Mean WHtR (SD) ^l	4.5 (2.0)		5.4 (2.0)		3.6 (1.3)		5.1 (2.1)		4.0 (1.9)	
Premenopausal FBC ^d	1,166		152		440		418		156	
<3.35	499	43	34	22	253	58	121	29	91	58
3.35-<4.98	364	31	49	32	136	31	140	33	39	25
≥4.98	303	26	69	45	51	12	157	38	26	17
Mean WHtR (SD) ^m	4.1 (1.9)		5.0 (1.9)		3.4 (1.3)		4.7 (2.1)		3.5 (2.0)	
Postmenopausal FBC										
<3.35	410	26	21	9	205	40	74	14	110	37
3.35-<4.98	563	35	83	35	207	40	175	32	98	33
≥4.98	621	39	134	56	104	20	295	54	88	30
Mean WHtR (SD) ⁿ	4.7 (2.0)		5.6 (2.1)		3.9 (1.3)		5.5 (2.0)		4.2 (1.8)	

Abbreviations. AABCS, Asian American Breast Cancer Study; BMI, body mass index; CARE, Women's Contraceptive and Reproductive Experiences Study; FBC, first primary invasive breast cancer; HT, hormone therapy; LACE, Life After Cancer Epidemiology Study; MEC, Multiethnic Cohort; NC-BCFR, Northern California Breast Cancer Family Registry; SFBCS, San Francisco Bay Area Breast Cancer Study; SD, standard deviation; WC, waist circumference; WHtR, waist-to-height ratio.

^a Body mass index (BMI) in the year before FBC diagnosis (AABCS, CARE, LACE, NC-BCFR, SFBCS) or at study enrollment in MEC was based on self-reported weight and height and calculated as weight (kg) divided by height (m) squared. Missing self-reported height in AABCS and SFBCS was supplemented with measured height.

^b For African American, Hispanic, and non-Hispanic White women, BMI (kg/m²) was categorized as normal weight (<25), overweight (25 - <30), or obesity (≥30). For Asian American women, BMI (kg/m²) was categorized as normal weight (<23), overweight (23 - <27.5), or obesity (≥27.5), according to cut-points for Asian populations. Underweight (BMI <18.5 kg/m²) was combined with the normal weight category.

^c Differences in distributions of BMI and mean BMI by race and ethnicity were statistically significant for all FBC combined, premenopausal FBC, and postmenopausal FBC.

^d Includes women with unknown menopausal status at the time of FBC diagnosis (aged <55 years who still had menstrual periods when they started using HT).

^e Waist circumference measured at interview, available from AABCS and SFBCS.

^f Differences in distributions of WC and mean WC by race and ethnicity were statistically significant for all FBC combined, premenopausal FBC, and postmenopausal FBC.

^g Differences in distributions of WHtR by race and ethnicity were statistically significant for all FBC combined, premenopausal FBC, and postmenopausal FBC.

^h For all FBC combined, differences in mean WHtR were statistically significant for all pairwise comparisons, except between African American and Hispanic FBC.

ⁱ For premenopausal FBC, differences in mean WHtR were statistically significant for all pairwise comparisons, except between African American and Hispanic FBC and between Asian American and non-Hispanic White FBC.

^j For postmenopausal FBC, differences in mean WHtR were statistically significant for all pairwise comparisons, except between African American and Hispanic FBC and between Asian American and non-Hispanic White FBC.

^k Differences in distributions of body roundness index by race and ethnicity were statistically significant for all FBC combined, premenopausal FBC, and postmenopausal FBC.

^l For all FBC combined, differences in mean body roundness index were statistically significant for all pairwise comparisons, except between African American and Hispanic FBC.

^m For premenopausal FBC, differences in mean body roundness index were statistically significant for all pairwise comparisons, except between African American and Hispanic FBC and between Asian American and non-Hispanic White FBC.

ⁿ For postmenopausal FBC, differences in mean body roundness index were statistically significant for all pairwise comparisons, except between African American and Hispanic FBC.

**Supplementary Table 4. Associations of body mass index ^{a,b} with risk of contralateral breast cancer, by race and ethnicity and menopausal status:
The California Breast Cancer Survivorship Consortium**

[illegible]

**Survivors of
hormone receptor-
positive FBC^f**

Normal weight	363	18	1.0	593	36	1.0	500	26	1.0	1,223	72	1.0
Overweight/obesity ^g	907	52	1.35 (0.79-2.33)	664	43	1.17 (0.74-1.86)	1,057	49	1.03 (0.63-1.69)	1,083	67	1.09 (0.78-1.53)
Per 5 kg/m ² increase			1.11 (0.94-1.31)			1.00 (0.81-1.22)			1.05 (0.88-1.25)			1.00 (0.87-1.15)
P-het race/ethnicity = 0.81												
P-het HoR status			0.93			0.77			0.49			0.83

**Survivors of
hormone receptor-
negative FBC^h**

Normal weight	147	10	1.0	134	11	1.0	175	13	1.0	286	21	1.0
Overweight/obesity ^g	358	28	1.27 (0.61-2.61)	159	17	1.29 (0.62-2.66)	343	30	1.32 (0.67-2.60)	304	25	1.40 (0.77-2.55)
Per 5 kg/m ² increase			1.08 (0.86-1.34)			1.22 (0.70-2.13)			1.07 (0.85-1.35)			1.07 (0.87-1.31)
P-het race/ethnicity = 0.99												

Abbreviations. AABCS, Asian American Breast Cancer Study; BMI, body mass index; CARE, Women's Contraceptive and Reproductive Experiences Study; CI, confidence interval; CBC, contralateral second primary invasive breast cancer; ER, estrogen receptor status; FBC, first primary invasive breast cancer; HR, hazard ratio; LACE, Life After Cancer Epidemiology Study; MEC, Multiethnic Cohort; NC-BCFR, Northern California Breast Cancer Family Registry; PR, progesterone receptor status; SFBCS, San Francisco Bay Area Breast Cancer Study.

^a Body mass index (BMI) in the year before FBC diagnosis (AABCS, CARE, LACE, NC-BCFR, SFBCS) or at study enrollment in MEC was based on self-reported weight and height and calculated as weight (kg) divided by height (m) squared. Missing self-reported height in AABCS and SFBCS was supplemented with measured height.

^b For African American, Hispanic, and non-Hispanic White women, BMI (kg/m²) was categorized as normal weight (<25), overweight (25 - <30), or obesity (≥30). For Asian American women, BMI (kg/m²) was categorized as normal weight (<23), overweight (23 - <27.5), or obesity (≥27.5), according to cut-points for Asian populations. Underweight (BMI <18.5 kg/m²) was combined with the normal weight category.

^c Analysis based on AABCS, CARE, LACE, MEC, NC-BCFR, and SFBCS.

^d Fine and Gray competing risk models adjusted for study (stratification variable), age at FBC diagnosis (continuous), FBC HoR status (ER-positive and/or PR-positive, ER-negative and PR-negative, unknown), and first-degree family history of breast cancer (yes, no, unknown).

^e Includes women with unknown menopausal status at the time of FBC diagnosis (aged <55 years who still had menstrual periods when they started using HT).

^f ER-positive and/or PR-positive FBC.

^g Overweight and obesity categories were combined because of small sample size.

^h ER-negative and PR-negative FBC.

Supplementary Table 5. Associations of central adiposity with risk of contralateral breast cancer for women with a first hormone receptor-negative breast cancer: The California Breast Cancer Survivorship Consortium

Analysis based on two studies ^a	Survivors with hormone receptor-negative FBC ^b		
	FBC	CBC	HR (95% CI) ^c
WC (cm, T1 vs. T2/3)			
<78.8	134	9	1.0
≥78.8)	327	39	2.21 (1.02-4.81)
Per 10 cm increase			1.21 (1.001-1.45)
WC (clinical cut-points, cm)			
<80	142	10	1.0
≥80	319	38	2.17 (1.05-4.52)
WHtR			
≤0.5	136	8	1.0
>0.5	325	40	2.04 (0.81-5.12)
Per 0.1 unit increase			1.38 (1.04-1.83)
Body roundness index (T1 vs. T2/3)			
<3.35	134	8	1.0
≥3.35	327	40	2.53 (1.17-5.46)
Per 1 unit increase			1.13 (0.998-1.27)

Abbreviations. AABCS, Asian American Breast Cancer Study; CI, confidence interval; CBC, contralateral second primary invasive breast cancer; ER, estrogen receptor status; FBC, first primary invasive breast cancer; HR, hazard ratio; PR, progesterone receptor status; SFBCS, San Francisco Bay Area Breast Cancer Study; T, tertile; WC, waist circumference; WHtR, waist-to-height ratio.

^a Analysis based on AABCS and SFBCS with available measurements of waist circumference.

^b ER-negative and PR-negative FBC.

^c Fine and Gray competing risk models adjusted for study (stratification variable), age at FBC diagnosis (continuous), race and ethnicity (African American, Asian American, Hispanic, non-Hispanic White), FBC hormone receptor status (ER-positive and/or PR-positive, ER-negative and PR-negative, unknown), and first-degree family history of breast cancer (yes, no, unknown), and BMI (continuous).

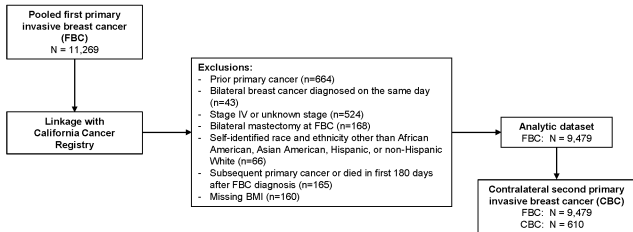
Supplementary Table 6. Associations of central adiposity with risk of contralateral breast cancer, by race and ethnicity and hormone receptor status of first breast cancer: The California Breast Cancer Survivorship Consortium

Analyses based on two studies ^{a,b}	Asian American			Hispanic		
	FBC N	CBC N	HR (95 CI) ^c	FBC N	CBC N	HR (95 CI) ^c
All survivors						
WC (cm, T1 vs. T2/3)						
<78.8	506	30	1.0	210	12	1.0
≥78.8	450	40	1.71 (1.08-2.72)	752	57	1.59 (0.84-3.00)
Per 10 cm increase			1.26 (1.03-1.54)			1.03 (0.89-1.20)
P-het race/ethnicity = 0.84						
WC (cm, clinical cut-points)						
<80	514	32	1.0	232	14	1.0
≥80	442	38	1.58 (1.001-2.50)	730	55	1.53 (0.82-2.82)
P-het race/ethnicity = 0.89						
WHtR						
≤ 0.5	488	28	1.0	198	12	1.0
>0.5	468	42	1.48 (0.81-2.72)	764	57	1.55 (0.75-3.23)
Per 0.1 unit increase			1.55 (1.14-2.10)			1.03 (0.82-1.30)
P-het race/ethnicity = 0.52						
Body roundness index (T1 vs. T2/3)						
<3.35	458	27	1.0	195	12	1.0
≥3.35	498	43	1.75 (1.08-2.84)	767	57	1.44 (0.76-2.73)
Per 1 unit increase			1.23 (1.07-1.42)			1.00 (0.91-1.11)
P-het race/ethnicity = 0.63						
Survivors of hormone receptor-positive FBC ^d						
WC (cm, T1 vs. T2/3)						
<78.8	325	18	1.0	149	9	1.0
≥78.8	292	21	1.49 (0.80-2.78)	531	33	1.17 (0.55-2.48)
Per 10 cm increase			1.19 (0.91-1.55)			0.93 (0.75-1.16)
P-het race/ethnicity = 0.72						
WC (cm, clinical cut-points)						
<80	330	19	1.0	167	11	1.0
≥80	287	20	1.38 (0.74-2.56)	513	31	1.04 (0.50-2.15)
P-het race/ethnicity = 0.66						
WHtR						
≤ 0.5	318	16	1.0	140	10	1.0
>0.5	299	23	1.26 (0.55-2.87)	540	32	0.93 (0.40-2.17)
P-het race/ethnicity = 0.22						
Per 0.1 unit increase			1.46 (0.98-2.17)			0.89 (0.64-1.25)
Body roundness index (T1 vs. T2/3)						

<3.35	295	15	1.0	138	10	1.0
≥3.35	322	24	1.78 (0.93-3.43)	542	32	0.91 (0.43-1.91)
Per 1 unit increase			1.19 (0.99-1.44)			0.95 (0.82-1.10)
P-het race/ethnicity = 0.25						

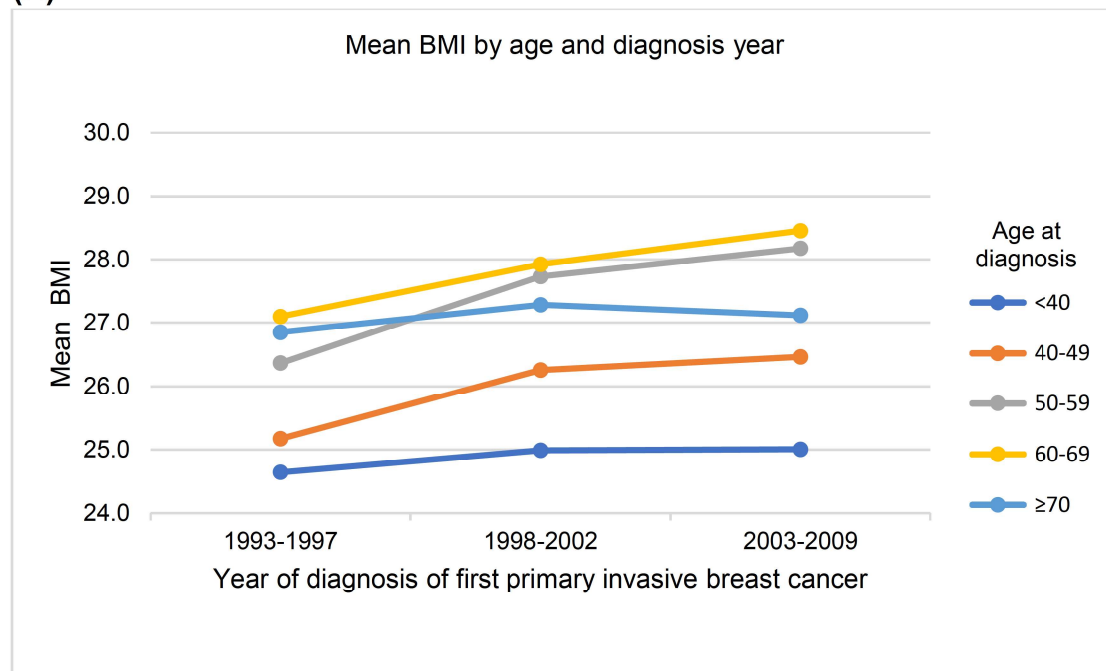
Abbreviations. AABCS, Asian American Breast Cancer Study; CI, confidence interval; CBC, contralateral second primary invasive breast cancer; ER, estrogen receptor status; FBC, first primary invasive breast cancer; HR, hazard ratio; PR, progesterone receptor status; SFBCS, San Francisco Bay Area Breast Cancer Study; T, tertile; WC, waist circumference; WHtR, waist-to-height ratio.

^a Analysis based on AABCS and SFBCS with waist measurements.
^b Because of small sample sizes, analyses are omitted for African American (390 FBC, 27 contralateral SBC) and non-Hispanic White (452 FBC, 26 contralateral SBC) women.
^c Fine and Gray competing risk models adjusted for study (stratification variable), age at FBC diagnosis (continuous), FBC hormone receptor status (ER-positive and/or PR-positive, ER-negative and PR-negative, unknown), first-degree family history of breast cancer (yes, no, unknown), and BMI (continuous).
^d ER-positive and/or PR-positive FBC. Analyses were omitted for hormone receptor-negative FBC because of small sample size.

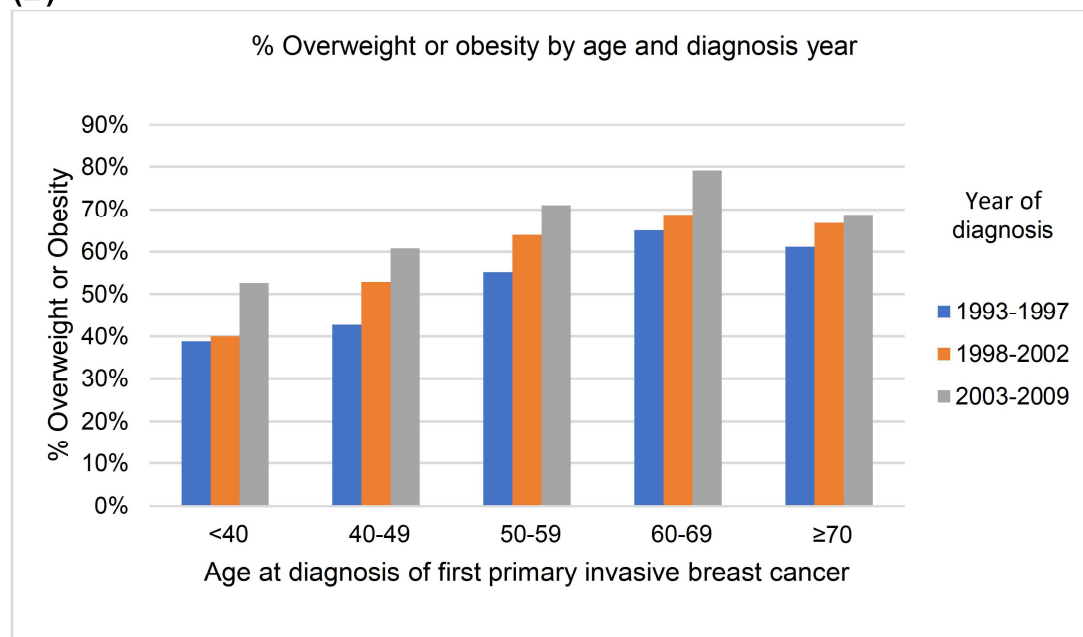


Supplementary Figure 1 CONSORT diagram for study sample

(A)



(B)



SUPPLEMENTARY FIGURE 2 (A) Mean BMI was estimated from linear models adjusted for age (continuous) and race and ethnicity, by year and age at diagnosis of first primary invasive breast cancer. (B) Proportion of overweight or obesity was calculated from frequency counts, by age and year of diagnosis of first primary invasive breast cancer.

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