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## Breast Cancer Risk After Recent Childbirth: A Pooled Analysis of 15 Prospective Studies

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## Abstract

**Background:** Parity is widely recognized as protective for breast cancer, but breast cancer risk may be increased shortly after childbirth. Whether this risk varies with breastfeeding, family history of breast cancer, or specific tumor subtype has rarely been evaluated.

**Objective:** To characterize breast cancer risk in relation to recent childbirth.

**Design:** Pooled analysis of individual-level data from 15 prospective cohort studies.

**Setting:** The international Premenopausal Breast Cancer Collaborative Group.

**Participants:** Women younger than 55 years.

**Measurements:** During 9.6 million person-years of follow-up, 18 826 incident cases of breast cancer were diagnosed. Hazard ratios (HRs) and 95% CIs for breast cancer were calculated using Cox proportional hazards regression.

**Results:** Compared with nulliparous women, parous women had an HR for breast cancer that peaked about 5 years after birth (HR, 1.80 [95% CI, 1.63 to 1.99]) before decreasing to 0.77 (CI, 0.67 to 0.88) after 34 years. The association crossed over from positive to negative about 24 years after birth. The overall pattern was driven by estrogen receptor (ER)-positive breast cancer; no crossover was seen for ER-negative cancer. Breast cancer risk increases after childbirth were pronounced when combined with a family history of breast cancer, and greater for women who were older at first birth or who had more births. Breastfeeding did not modify risk patterns.

**Limitations:** Breast cancer diagnoses during pregnancy were not uniformly distinguishable from early postpartum diagnoses. Data on human epidermal growth factor receptor 2 (*HER2*) oncogene overexpression were limited.

**Conclusion:** Compared with nulliparous women, parous women have an increased risk for breast cancer for more than 20 years after childbirth. Health care providers should consider recent childbirth a risk factor for breast cancer in young women.

## Abstract

Parity is widely recognized as protective for breast cancer, but there is evidence that breast cancer risk may increase shortly after childbirth. Whether this risk varies with such factors as breastfeeding, family history of breast cancer, or specific tumor subtype has rarely been evaluated. To characterize breast cancer risk in relation to recent childbirth, this study pooled individual-level data for women younger than 55 years from 15 prospective cohort studies.

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Breast cancer is the leading cancer diagnosis among reproductive-aged women worldwide (1). Parity is recognized as a protective factor for breast cancer overall, but this may largely apply to the peak ages of incidence (after age 60 years) and may not be true for younger women. Previous studies have reported that recent childbirth confers a short-term increase in breast cancer risk (2–13), which may last 10 or more years (6, 11, 14–16) and be amplified in women who are older at first birth (6, 11, 15, 16). Evidence for this increased risk often comes from national registry linkage studies in Scandinavian countries (2, 4, 6, 17). Information about such behaviors as breastfeeding is often not available or comes from

case-control studies (8–11), where potential risk factors are assessed after diagnosis and parenting responsibilities could differentially deter study participation.

We used combined data from 15 cohort studies to assess breast cancer risk after childbirth. The use of international, prospective data offers a new opportunity to assess the strength and duration of associations between recent childbirth and breast cancer risk while considering the effect of such factors as breastfeeding and family history of breast cancer (5, 18) and to evaluate risk specific to breast cancer subtypes that may be differentially influenced by reproductive history (12, 13, 19). Understanding these patterns may have implications for identifying risk-reducing strategies and vulnerable subgroups.

## Methods

We used data from the Premenopausal Breast Cancer Collaborative Group, a pooling project involving 20 prospective cohort studies (20). This work was approved by the relevant institutional review boards.

In brief, participating studies contributed data from women aged younger than 55 years who did not have breast cancer at enrollment; these women were followed prospectively through direct contact or linkage with cancer registries (described previously [20]). Studies contributed (as available) age at enrollment and end of follow-up, demographic characteristics, lifestyle factors, reproductive history, medical conditions, and first-degree family history of breast cancer at enrollment and each follow-up round. Data harmonization and quality control were done by the study coordinating centers in North Carolina and London.

Across 15 cohorts that provided information on women's ages at childbirth (21–35), 890 269 women (96% of participants) had available information on total number of births and age at most recent birth or were nulliparous. We excluded women who reported a first birth before age 13 years ( $N=82$ ), were 50 years or older at study entry and at most recent birth ( $N=60$ ), or reached parity greater than 10 births before enrollment ( $N=183$ ). These events were considered to have greater potential for data errors. This left 889 944 women for analysis (Supplement Figure 1, available at [Annals.org](https://annals.org)).

Attained age, ages at first and most recent births, and parity at study enrollment were available in all 15 studies (21–35). Twelve studies (21–27, 29, 31, 33–35) assessed pregnancy history in at least 1 follow-up questionnaire after enrollment; the remaining 3 provided pregnancy information at enrollment only. Breastfeeding status was available in 12 studies (21–23, 25–27, 29–34) and family history in 13 (21–27, 29, 31–35). Thirteen studies (21–23, 25–27, 29–35) reported breast cancer stage and estrogen receptor (ER) status.

## Statistical Analysis

Parity, time since most recent birth, breastfeeding, and family history of breast cancer were analyzed as time-varying exposures over follow-up. We used Cox proportional hazards regression to calculate hazard ratios (HRs) and 95% CIs for the association between time since most recent birth and breast cancer, with attained age as the underlying time scale (17,

36). Follow-up started at age at study enrollment or the first available follow-up round with information on age at most recent birth and ended at breast cancer diagnosis, death, last follow-up, or age 55 years, whichever occurred first. During follow-up, women were censored at the age they reached parity greater than 10 births ( $N=22$ ) or the age they had a birth at age 50 years or older ( $N=9$ ) (Supplement Figure 1). Proportional hazards assumptions were assessed by Schoenfeld residuals (37) and were not significantly violated.

We first examined study-specific estimates and calculated a pooled estimate across studies using a random-effects model that weighted estimates by the inverse of the study-specific variance (38–40). Because we detected no significant heterogeneity between studies with the Cochran  $Q$  test or  $I^2$  statistic (41–43) (Supplement Figure 2, available at [Annals.org](https://annals.org)), we pooled individual-level data and did an aggregated analysis stratified by study cohort. Supplement Table 1 (available at [Annals.org](https://annals.org)) gives characteristics of the individual cohorts.

Time since most recent birth and parity were modeled as time-varying exposures in 1-year and 1-birth increments, respectively. We accounted for additional births during follow-up by resetting time since birth to 0 at the time of each birth. The Supplement (available at [Annals.org](https://annals.org)) gives additional detail on these methods. Quadratic splines (44) were used to examine time since birth as a continuous, nonlinear exposure, defining time with knots at the 5th, 25th, 50th, 75th, and 95th percentiles for the distribution of time since most recent birth for women with a breast cancer diagnosis before age 55 years. In spline models, time since most recent birth was set to 0 for nulliparous women and an indicator term for parity allowed the risk at 0 years since most recent birth to differ between nulliparous and parous women. As an approximation of the 95% CI (in years since most recent birth) for the point where the HR crossed 1.0, we used the points where the lower and upper bounds of the 95% CI for the spline regression crossed 1.0. In categorical models, exposure was defined as nulliparous or 0 to 2.9, 3 to 4.9, 5 to 9.9, 10 to 14.9, 15.0 to 19.9, 20.0 to 24.9, 25.0 to 29.9, or 30 or more years since most recent birth.

Covariates considered as potential confounders were parity, age at first birth, breastfeeding, infertility, education, oral contraceptive use, and birth cohort. We identified confounding variables using a directed acyclic graph (45, 46) and the prior literature (Supplement Figure 3, available at [Annals.org](https://annals.org)); the minimally sufficient adjustment set was parity and breastfeeding. All models were adjusted for attained age (as the time scale; continuous), study, and parity (1 to 10 births; time-varying). Adjustment for breastfeeding was possible only in analyses limited to the 12 studies with available breastfeeding data.

We evaluated potential effect modification by parity (primiparous [1 birth], biparous [2 births], or multiparous [≥3 births]), age at first birth (<25, 25 to 34, or 35 to 39 years), breastfeeding, and family history of breast cancer. Interactions between these factors and time since most recent birth were assessed using likelihood ratio tests (47). We examined risk for invasive nonmetastatic disease (stage I to III breast cancer) by treating breast cancer of stage 0 (in situ) or IV as a censoring event. Augmentation models were used to assess differences in HRs by ER status by using the Wald test (48).

In repeated analyses, we restricted the cohort to parous women only, censored follow-up at age 45 years or the last age at which pregnancy history was assessed if younger than 45 years (to minimize the potential for additional pregnancies after the most recent questionnaire), excluded each study in turn to identify potentially influential studies, and excluded women with multiple births (for example, twins).

We also calculated the weighted cumulative hazard of breast cancer according to attained age for categories of time since most recent childbirth (nulliparous and 0 to 2.9, 3 to 6.9, 7 to 14.9, 15 to 24.9, and 25 or more years), adjusted for the distribution of parity in the overall pooled sample using an inverse probability of exposure approach, described further in Supplement Figure 4 (available at [Annals.org](#)) (49). Because our data were left-truncated, we also provided a standardized weighted cumulative hazard function calculated over a common age interval that had participants in each category of time since most recent birth. The standardized weighted cumulative hazard function starts at 0 at the beginning of the common age interval and cumulates throughout the interval, which allows comparison of the cumulative hazard across categories of time since most recent birth (Supplement Figure 5, available at [Annals.org](#)).

Analyses were done with SAS, version 9.3 (SAS Institute); figures were produced in SAS and R (R Foundation for Statistical Computing).

## Results

During 9 625 727 person-years of follow-up (mean, 10.8 years [SD, 6.4]), 18 826 incident cases of breast cancer were diagnosed before age 55 years among 889 944 women. At enrollment, 720 555 women were parous; 71 609 women contributed 1 or more births during follow-up. The mean age at study entry was 41.8 years (range, 16.0 to 54.9 years). The last update of pregnancy information occurred at a mean age of 50.0 years (range, 16.0 to 76.7 years). Overall, 12.4% of person-years were contributed by women who reported a family history of breast cancer (Table). For parous women, 72.9% of person-years were contributed by women who reported breastfeeding.

Figure 1 shows the association between time since most recent birth and breast cancer risk, modeled nonlinearly as a continuous exposure. Compared with nulliparous women, parous women had an HR for breast cancer associated with time since most recent birth that peaked 4.6 years after birth (HR, 1.80 [95% CI, 1.63 to 1.99]) before decreasing to its lowest observed point (HR, 0.77 [CI, 0.67 to 0.88]) 34.5 years after birth; the crossover in risk occurred 23.6 years (CI, 21.9 to 25.0 years) after birth. Over a common age interval starting at age 41.5 years, the standardized cumulative hazard of breast cancer per 100 000 person-years among nulliparous women was 1494 at age 45.0 years, 2132 at age 47.5 years, and 2846 at age 50.0 years. For comparison, the standardized cumulative hazard among women who had their most recent child 3 to 6.9 years before was 1496 at age 45.0 years, 2265 at age 47.5 years, and 3060 at age 50.0 years (Supplement Figure 5. This corresponds to 2, 133, and 214 excess cases of breast cancer per 100 000 person-years at each respective age for women whose most recent birth was 3 to 6.9 years before compared with nulliparous women.



The association between time since most recent birth and breast cancer risk was modified by family history of breast cancer ( $P=0.044$ ). Supplement Figure 6 (available at [Annals.org](#)) shows analyses done separately for women who did and did not have such a history. The peak HRs associated with time since most recent birth were 1.74 (CI, 1.54 to 1.96) at 4.6 years after birth for women without a family history and 1.82 (CI, 1.48 to 2.24) at 4.9 years in women with a family history. However, compared with women with neither risk factor (that is, nulliparous women without a family history of breast cancer), those with both (parous women with a family history) had a peak HR for breast cancer of 3.53 (CI, 2.91 to 4.29) at 4.9 years after birth (Figure 2).

We observed significant heterogeneity in the association between time since most recent birth and breast cancer risk according to age at first birth ( $P=0.013$ ) (Figure 3) and parity ( $P=0.030$ ) (Figure 4), but not breastfeeding ( $P=0.38$ ) (Supplement Figure 7, available at [Annals.org](#)). Peak HRs for breast cancer associated with recent childbirth seemed to be higher with increasing age at first birth; women who were youngest at first birth (<25 years) did not have an increased risk for breast cancer compared with nulliparous women (Figure 3). The magnitude of peak HRs was smaller than that seen overall owing to the inability to adjust for parity continuously (1 to 10 births) across age-at-first-birth groups because few women who were older at first birth had 3 or more children. When primiparous, biparous, and multiparous women were evaluated separately, the magnitude of peak HRs was greatest (and the time to crossover toward an inverse association longest) among multiparous women (Figure 4).

The association between time since most recent birth and breast cancer risk differed by ER status ( $P<0.001$ ) (Figure 5). Risk for ER-negative breast cancer was highest 2.2 years after birth (HR, 1.77 [CI, 1.34 to 2.33]) and decreased to an HR of 1.38 (CI, 1.01 to 1.88) at 34.5 years after birth but did not cross over to a protective association. The pattern for ER-positive breast cancer, which accounted for 76% of all breast cancer cases, was similar to the overall results. Additional adjustment for breastfeeding history changed results only slightly for ER-negative breast cancer risk and did not detectably change ER-positive risk (Supplement Figure 8, available at [Annals.org](#)). In risk models for ER-negative breast cancer, the test for interaction between time since most recent birth and breastfeeding was statistically significant ( $P=0.020$ ). Risk for ER-negative cancer was generally higher for parous women compared to nulliparous women, regardless of breastfeeding status, although the pattern of risk with increasing time since most recent childbirth was less consistent among women who never breastfed, potentially because of smaller sample sizes (Supplement Table 2, available at [Annals.org](#)).

Supplement Table 3 (available at [Annals.org](#)) shows analyses according to ER status and restricted to parous women. In models that defined the reference group as women 10 to 14.9 years from most recent birth, we continued to see a long-term crossover toward a protective association for ER-positive (but not ER-negative) breast cancer. Hazard ratios for breast cancer were similar in models that included all breast cancer diagnoses (stages 0 to IV) or that censored in situ (stage 0) or distant (stage IV) diagnoses (Supplement Table 4, available at [Annals.org](#)).

Results were essentially unchanged in sensitivity analyses that censored women at the last age where pregnancy was assessed if it was less than 45 years (to minimize the potential for additional pregnancies after the most recent questionnaire), excluded 1 study at a time, or excluded multiple births (data not shown).

## Discussion

Our analysis combined individual-level data from about 890 000 women from 15 prospective cohort studies across 3 continents to investigate breast cancer risk in reproductive-aged women. Compared with women who had not given birth, parous women had an elevated breast cancer risk that peaked around 5 years after childbirth and lasted about 20 years. Our results provide evidence that, overall, this association is not modified by breastfeeding and that it varies according to ER expression, age at first birth, and family history of breast cancer.

To our knowledge, the effect of breastfeeding on breast cancer risk after childbirth has not been directly addressed before. Breastfeeding has been associated with an estimated 12% to 25% lower risk for premenopausal breast cancer overall (50, 51) and is thought to be particularly beneficial in reducing risk for ER-negative breast cancer, which is relatively more common at young ages than older ages. Although higher parity is associated with an overall increase in risk for ER-negative breast cancer (13, 52, 53), parous women who breastfeed have comparable risk to nulliparous women (13), suggesting that breastfeeding may mitigate parity-related increases in risk for ER-negative cancer.

In the current analysis of 12 international studies, risks for both ER-positive and ER-negative breast cancer were elevated for 20 years after most recent birth in parous compared with nulliparous women, regardless of breastfeeding. With longer follow-up, the expected inverse association between childbirth and breast cancer became apparent for ER-positive breast cancer, but risk remained elevated for ER-negative disease. These findings are consistent with a sustained increase in risk for ER-negative breast cancer for at least 25 years after birth in parous compared with nulliparous women, as reported in a pooled analysis of 4 U.S. studies that enrolled African American women (12). However, our findings disagree with that study's report of no increase in ER-positive breast cancer in the first 15 years after last birth.

Familial breast cancer tends to occur at a younger age than breast cancer in women without a genetic predisposition. Family history might therefore modify associations between recent childbirth and breast cancer risk. A study in Denmark (5) found stronger associations between recent childbirth (<5 years prior) and breast cancer risk among women with a mother or sister diagnosed with breast cancer than among those without. In Norway (18), short-term elevations in risk after childbirth were more apparent in women with a family history of breast cancer than in a common reference group of nulliparous women without such a history, although differences were not statistically significant. In our analysis, women with both a recent birth and a family history of breast cancer had a 3.5-fold increase in breast cancer risk compared with women with neither characteristic.

The large number of cases in our pooled analysis allowed us to evaluate potential variation in the association between recent childbirth and breast cancer according to modifiable behaviors, familial susceptibility, and clinical subtypes. These considerations can rarely be addressed in individual studies because of the lower incidence and correspondingly small numbers of breast cancer diagnoses at young ages. However, calendar month was not uniformly available for ages at childbirth and breast cancer diagnosis, so we could not distinguish breast cancer cases diagnosed during pregnancy from those diagnosed in the months immediately postpartum. The small number of breast cancer cases and births that occurred at same integer age ( $N = 39$ ) resulted in wide CIs for the HR estimate for the first year after childbirth. Our analyses do not address breast cancer risk after age 55 years because of limits of the data provided to the Premenopausal Breast Cancer Collaborative Group (20). We did not address associations according to intervals between births; 1 prior study has suggested that longer intervals could magnify childbirth-related increases in breast cancer risk (17). Available breastfeeding information was not specific to each birth; therefore, if women breastfed some children but not others, breastfeeding status may be misclassified for the most recent birth. Finally, we had limited data on *HER2* oncogene overexpression and could not evaluate whether associations differed by the *HER2* status of the tumor. In a case-only study of Hispanic women, those within 10 years of their last full-term pregnancy (vs. >10 years) had higher risk for *HER2*-positive disease (OR, 1.78 [CI, 1.08 to 2.93]) than for cancer that is ER- or progesterone receptor-positive and *HER2*-negative (19).

Several biological explanations for a transient increase in breast cancer risk after childbirth have been proposed. Proliferation of breast cells during pregnancy could promote accelerated development of latent initiated tumor cells (46, 54). In this way, a greater magnitude of risk conferred by older age at first birth could be due to a higher proportion of initiated cells at older ages. The postpartum breast microenvironment, characterized by lactational involution, may also facilitate cancer cell migration and metastasis; the observation that breast tumors diagnosed postpartum have more advanced stages at diagnosis than those diagnosed during pregnancy supports this mechanism (55–58). Although the higher proportion of advanced-stage tumors could also be due to less timely detection of breast cancer in lactating women, our similar results in analyses limited to stage I to III cancer and stratified by breastfeeding suggest that differential detection after childbirth is not the sole cause.

Breast cancer is the most common cancer type in reproductive-aged women. We report an increased risk for breast cancer after childbirth that can last more than 20 years. This risk may be enhanced when a woman is older at first birth or has a family history of breast cancer, and it is not mitigated by breastfeeding. Women and health care professionals should take these factors into account when considering individual risk profiles for breast cancer.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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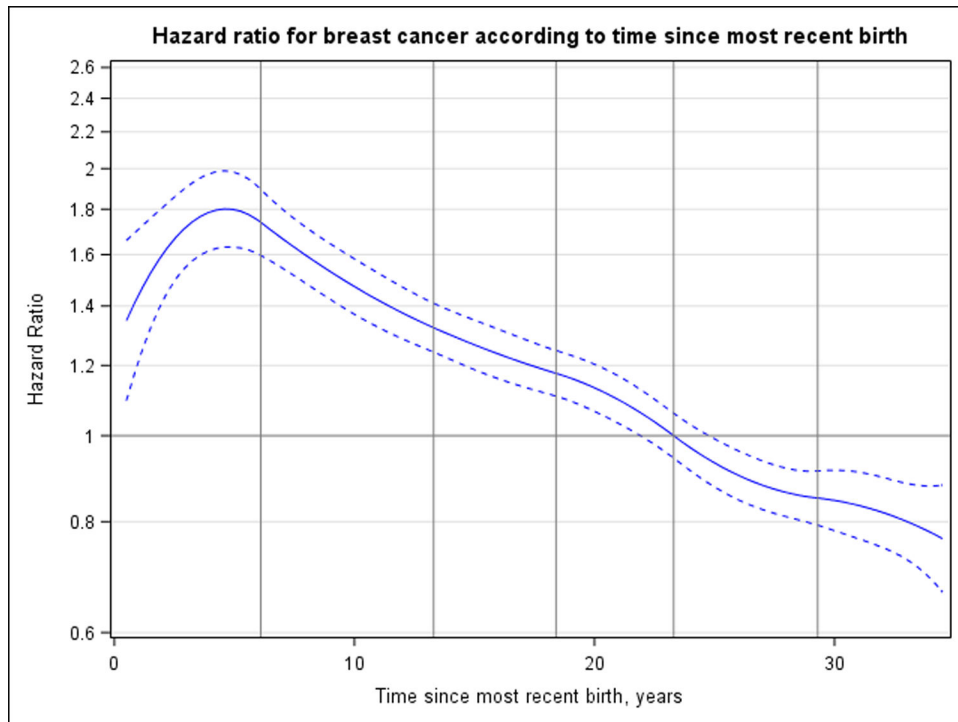
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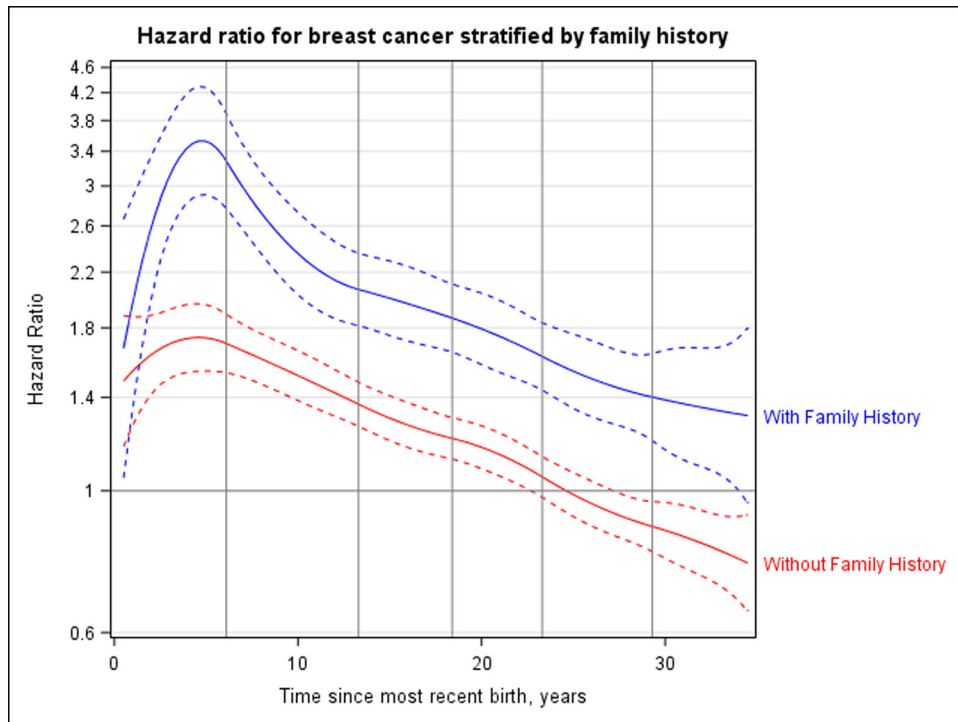
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**Figure 1. HR for breast cancer according to years since most recent birth.**

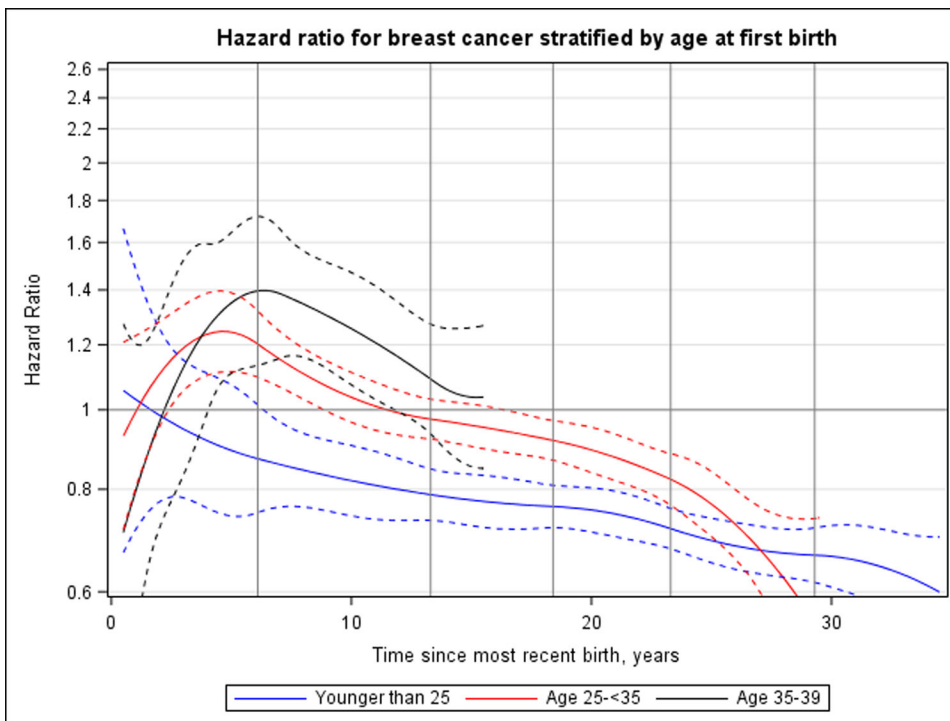
Nulliparous women are the reference group, and HRs are adjusted for attained age, study, and continuous parity. Dashed curves correspond to 95% CIs. Vertical lines represent the quadratic spline knots at 6.1, 13.3, 18.4, 23.3, and 29.3 y after birth. The HR for breast cancer risk peaks at 1.80 (95% CI, 1.63 to 1.99) at 4.6 y, crosses 1 at 23.6 y (CI, 21.9 to 25.0 y), and reaches its lowest observed point (HR, 0.77 [CI, 0.67 to 0.88]) at 34.5 y after birth. HR = hazard ratio.



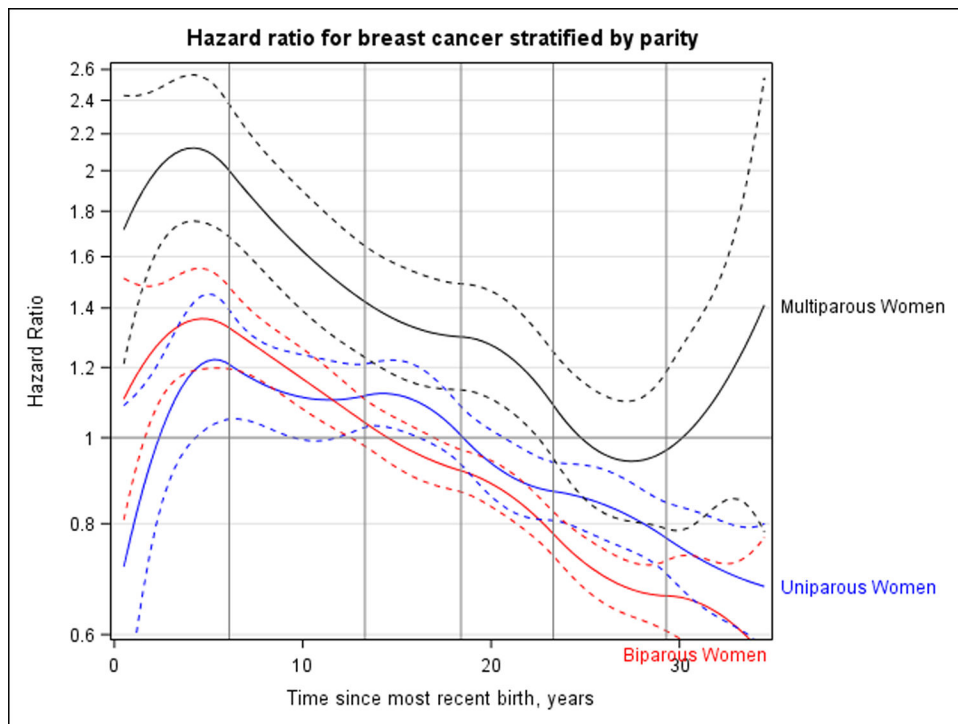


**Figure 2. HR for breast cancer according to years since most recent birth for the joint effect of family history and time since most recent birth.**

Nulliparous women without a family history of breast cancer are the reference group, and HRs are adjusted for attained age, study, and continuous parity. Dashed curves correspond to 95% CIs. Vertical lines represent the quadratic spline knots at 6.1, 13.3, 18.4, 23.3, and 29.3 y after birth. Likelihood ratio tests for models with and without interaction terms for time since most recent birth indicated a statistically significant ( $P=0.044$ ) interaction with family history of breast cancer. Compared with a common reference group of nulliparous women without such a history, women with a family history of breast cancer had an HR of 3.53 (CI, 2.91, 4.29) 4.9 y after first birth and did not cross over toward a protective effect for 30 y. As an approximation of the 95% CI around the crossover point, for women without a family history, the lower bound crosses at 22.9 y and the upper bound at 27.4 y. For women with a family history, the lower bound crosses at 34.2 y and the upper bound does not cross 1 during the 34.5 y of follow-up. HR = hazard ratio.

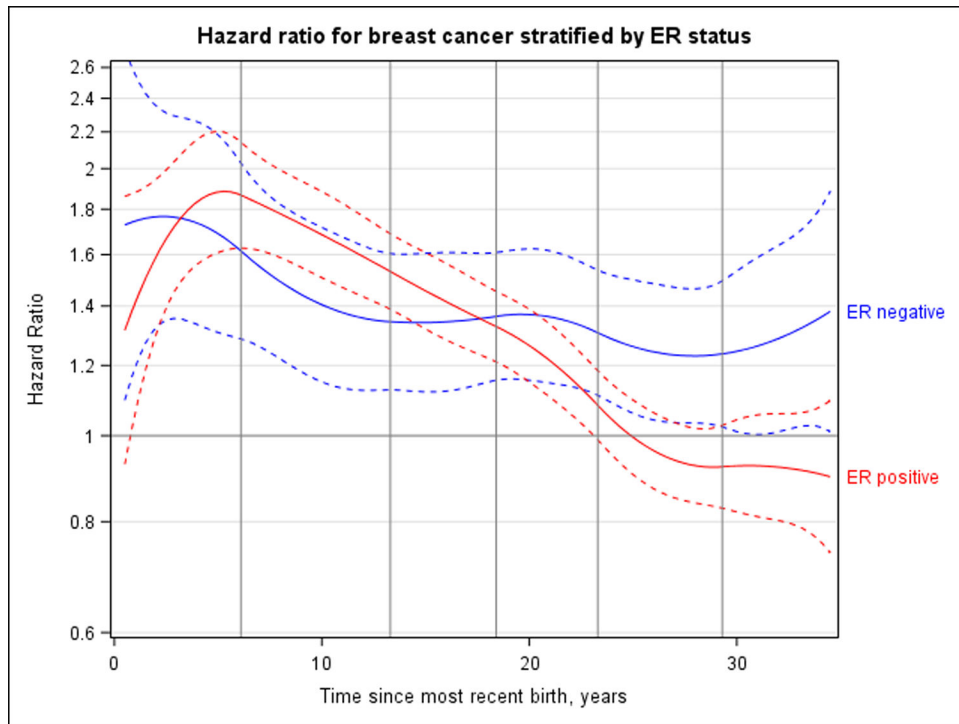


**Figure 3. HR for breast cancer according to years since most recent birth, stratified by age at first birth (nulliparous or parous with age at first birth <25, 25–34, or 35–39 y).** Nulliparous women are the reference group, and HRs are adjusted for attained age, study, and parity (0, 1, or 2 births). Dashed curves correspond to 95% CIs. Vertical lines represent the quadratic spline knots at 6.1, 13.3, 18.4, 23.3, and 29.3 y after birth. Likelihood ratio tests indicated a statistically significant interaction with age at first birth ( $P=0.013$ ). All analyses censor at age 55 y; therefore, only the first 15 y of follow-up are analyzed for women in the oldest age group (35–39 y) because they were aged 50 y after 15 y. Women who had their first birth before age 25 y had a peak HR for breast cancer of 1.06 (95% CI, 0.67 to 1.66) at <1 y after birth. For women who had their first births at age 25–34 y and 35–39 y, peak HRs were 1.25 (CI, 1.11 to 1.40) at 4.6 y and 1.40 (CI, 1.14 to 1.72) at 6.4 y, respectively, since most recent birth. HR = hazard ratio.



**Figure 4. HR for breast cancer according to years since most recent birth, stratified by parity (0, 1, 2, or 3 births).**

Nulliparous women are the reference group, and HRs are adjusted for attained age and study; estimates for women with 3 births are further adjusted for continuous number of births (3–10 births). Dashed curves correspond to 95% CIs. Vertical lines represent the quadratic spline knots at 6.1, 13.3, 18.4, 23.3, and 29.3 y after birth. Likelihood ratio tests indicated a statistically significant interaction with parity ( $P=0.030$ ). For uniparous women, the peak HR was 1.22 (95% CI, 1.03 to 1.45) and occurred 5.3 y after last birth; crossover toward an inverse association occurred 18.5 y (CI, 16.5 to 20.9 y) after first birth for uniparous women. For biparous women, the peak HR was 1.36 (CI, 1.19 to 1.55) at 4.6 y after last birth; crossover toward an inverse association occurred 14.8 y (CI, 12.7 to 17.2 y) after last birth. For women with 3 births, the peak HR was 2.12 (CI, 1.75 to 2.56) at 4.2 y after last birth, crossover toward an inverse association occurred 25.0 y since last birth, and the lower bound of the CI crossed over at 22.6 y. HR = hazard ratio.



**Figure 5. HR for ER-positive and ER-negative breast cancer according to years since most recent birth, adjusted for attained age, study, and parity (continuous).**

Nulliparous women are the reference group. Dashed curves correspond to 95% CIs. Vertical lines represent the quadratic spline knots at 6.1, 13.3, 18.4, 23.3, and 29.3 y after birth. Tests for interaction with ER status were statistically significant ( $P < 0.001$ ). ER-negative breast cancer risk peaked 2.2 y after birth (HR, 1.77 [95% CI, 1.34 to 2.33]), and the HR decreased to 1.38 (CI, 1.01 to 1.88) at 34.5 y after birth but did not cross over to a protective association. ER-positive breast cancer had a peak HR of 1.88 (CI, 1.62 to 2.20) at 5.3 y, crossing the null value at 25.0 y and reaching an HR of 0.90 (CI, 0.74 to 1.09) at 34.5 y. ER = estrogen receptor; HR = hazard ratio.

**Table.**

Distribution of Person-Years Among 889 944 Women in 15 Prospective Cohort Studies, by Exposure Characteristics\*

Variable	Person-Years, <i>n</i> (%) <sup>†</sup>	Cases of Breast Cancer, <i>n</i>	Stage, <i>n</i> <sup>‡</sup>			Type of Breast Cancer, <i>n</i> <sup>§</sup>	
			0	I–III	IV	ER-Positive	ER-Negative
<b>Total</b>	9 625 727 (100)	18 826	2319	9428	247	8508	2758
<b>Time since most recent birth</b>							
Nulliparous	1 680 909 (17.5)	3033	413	1446	38	1396	394
0–2.9 y	402 357 (4.2)	219	22	125	5	84	57
3.0–4.9 y	317 723 (3.3)	308	41	173	5	126	58
5.0–9.9 y	1 082 408 (11.2)	1437	193	753	18	608	216
10.0–14.9 y	1 555 448 (16.2)	2780	346	1461	39	1256	388
15.0–19.9 y	1 839 722 (19.1)	4185	497	2152	41	1917	583
20.0–24.9 y	1 624 570 (16.9)	4017	495	1964	48	1820	597
25.0–29.9 y	882 071 (9.2)	2208	231	1045	42	1001	350
30.0 y	240 519 (2.5)	639	81	309	11	300	115
<b>Age at first birth</b>							
13–23 y	3 149 633 (39.1)	5562	598	2882	81	2295	921
24–25 y	1 493 666 (18.5)	2851	344	1428	44	1260	422
26–29 y	2 026 933 (25.2)	4246	534	2154	54	2000	612
30–39 y	1 327 752 (16.5)	3001	407	1455	30	1482	395
40–49 y	55 027 (0.7)	130	22	61	0	73	13
Missing	1848 (0)	3	1	2	0	2	1
<b>Parity</b>							
0	1 680 909 (17.5)	3033	413	1446	38	1396	394
1	1 569 982 (16.3)	3190	404	1451	40	1412	479
2	3 628 391 (37.7)	7548	904	3664	99	3427	1111
3	1 890 292 (19.6)	3639	422	1994	46	1669	541
4	590 884 (6.1)	1015	130	604	19	429	165
5	169 499 (1.8)	264	30	174	4	122	45
6–10	95 770 (1.0)	137	16	95	1	53	23
<b>Family history of breast cancer</b>							
Yes	1 051 985 (12.4)	3587	666	2099	37	1983	545
No	7 087 732 (83.5)	11 737	1451	6736	181	5168	1691
Missing	346 339 (4.1)	1536	118	210	11	632	279
<b>Breastfeeding status (parous women only)</b>							
Yes	5 007 247 (72.9)	10 096	1368	5582	128	5020	1491
No	1 337 496 (19.5)	2924	418	1661	43	1460	595
Missing	519 487 (7.6)	879	109	613	36	390	182

ER = estrogen receptor.

\* Percentages may not sum to 100 due to rounding.

<sup>†</sup> Calculated for studies that provided information on the characteristic of interest and that reflect changes in time-updated exposures, including time since most recent birth, parity, family history, and breastfeeding status.

<sup>‡</sup> Available for 11 994 women.

<sup>§</sup> Available for 11 266 women.

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