# 5. EFFECT OF BREASTFEEDING ON MATERNAL HEALTH

Breastfeeding brings health benefits for the mother as well as the infant. The effect of breastfeeding on postpartum bleeding, the return of fertility, and mothers' risk of breast and ovarian cancer is described in the papers below.

## 5.1 Effect of Breastfeeding on Maternal Risk of Breast Cancer

***Tryggvadottir L, Tulinius H, Eyfjord JE, Sigurvinsson T. Breastfeeding and reduced risk of breast cancer in an Icelandic cohort study. Am J Epidemiol 2001;154:37–42.***

**COUNTRY:** Iceland

**SETTING:** Women visiting the Cancer Detection Clinic of the Icelandic Cancer Society

**DESIGN:** Nested case-control study: n = 10,722 (993 cases, 9,729 matched controls) separated into 3 age groups: < 40 years, 40–55 years, and > 55 years

**BREASTFEEDING DEFINITION:** Duration of any breastfeeding

**OUTCOME MEASURE:** Breast cancer incidence

**RESULTS:** An inverse dose-response relation between breastfeeding duration and risk of breast cancer was observed for women in the youngest age group (< 40 years). Data suggested a decreased risk of breast cancer in women who ever lactated compared with those who never lactated in all 3 age groups.

**METHODOLOGICAL ISSUES:** Variables used included: age at menarche, age at first birth, number of births, number of children breastfed, average number of weeks breastfeeding each child, use of oral contraceptives, height and weight. Duration of breastfeeding and age at diagnosis were used as variables for the 2 interaction models analyzed. Multiple logistic regression was applied for the multivariate analysis of matched data.

---

***Gao Y-T, Shu X-O, Dai Q, et al. Association of menstrual and reproductive factors with breast cancer risk: Results from the Shanghai Breast Cancer Study. Int J Cancer 2000;87:295–300.***

**COUNTRY:** China

**SETTING:** Urban Shanghai

**DESIGN:** Case-control (population-based) study of women between the ages of 25 and 64 years. Cases (n = 1,459) were diagnosed by 2 pathologists, and age-matched controls (n = 1,556) were randomly selected from females permanently living in urban Shanghai.

**BREASTFEEDING DEFINITION:** Ever having breastfed, never having breastfed, and duration of breastfeeding for each live birth

**OUTCOME MEASURE:** Breast cancer

**RESULTS:** Women who ever breastfed had an unadjusted odds ratio for breast cancer lower than those who never breastfed (OR = 0.6; 95% CI: 0.5–0.9). The cumulative duration of breastfeeding was associated with reduced risk of breast cancer. Women who breastfed for longer than 24 months had an odds ratio of 0.9 (95% CI: 0.7–1.4), compared with women who never breastfed. Breastfeeding was associated with reduced risk only among postmenopausal women.

**METHODOLOGICAL ISSUES:** Cases were slightly older and more likely to have had more years of education than controls.

---

***Lipworth L, Bailey R, Trichopoulos D. History of breast-feeding in relation to breast cancer risk: A review of the epidemiologic literature. J Natl Cancer Inst 2000;92:302–12.***

**COUNTRY:** Multicountry (mainly North America and Europe)

**SETTING:** Various

**DESIGN:** Review of studies between 1966 and 1998 that included more than 200 cases overall and explicitly controlled for number of full-term pregnancies and age at first birth

**BREASTFEEDING DEFINITION:** Ever versus never having breastfed and cumulative duration of breastfeeding

**OUTCOME MEASURE:** Breast cancer

**RESULTS:** Overall, the evidence of an inverse association between ever breastfeeding and breast cancer risk remains limited and inconclusive. Relative risks among parous women who have ever breastfed, compared with those who have never breastfed, range from 0.54 to just below 1.0. Regarding the number of children breastfed, the authors conclude that there is no clear trend of decreasing risk with increasing number of breastfed children. Regarding the cumulative effect of breastfeeding, adjusted odds ratios for premenopausal women who breastfed for > 12 months ranged from 0.21 to just under 1.0, compared with parous women who never breastfed.

The authors speculate that the failure of some studies to detect an association may be due to the low prevalence of prolonged breastfeeding, since there appears to be some evidence of the protective effect of extensive cumulative durations of breastfeeding in non-Western societies, which tend to breastfeed longer than women in Western societies. Women who stopped breastfeeding because of "insufficient milk" tended to have significantly elevated risks of breast cancer compared with women who successfully breastfed for at least 2 years (odds ratio ranged from 3.0 to 3.1). Women who ever breastfed were 3 times more likely than those who never breastfed to have estrogen receptor-positive tumors as opposed to estrogen receptor-negative tumors (the latter is more aggressive and less respondent to therapy). Regarding ethnicity, larger effects of increasing total months of breastfeeding and association with decreased risk of breast cancer were seen in African-American women than in Caucasian women (odds ratio = 0.45 and 0.76, respectively). Non-Hispanic white women who breastfed longer than 12 months had an odds ratio of 0.58, while their Hispanic counterparts had an odds ratio of 0.78. With regard to menopausal status, the protective effects of breastfeeding seem to be greatest in or confined to premenopausal women.

**METHODOLOGICAL ISSUES:** Relatively low prevalence of prolonged breastfeeding in Western populations reduces the ability of studies to detect effects. Inconsistent classification of breastfeeding history across studies presents problems for reviewers.

---

***Zheng T, Duan L, Liu Y, et al. Lactation reduces breast cancer risk in Shandong Province, China. Am J Epidemiol 2000;152:1129–35.***

**COUNTRY:** China

**SETTING:** Hospital-based population

**DESIGN:** Case-control study: n = 404 cases and 404 matched controls

**BREASTFEEDING DEFINITION:** None given

**OUTCOME MEASURE:** Risk of breast cancer

**RESULTS:** Later age at menarche, breastfeeding for > 24 months per child, and lifetime duration of breastfeeding of ≥72 months were associated with reduced risk of breast cancer. In addition, nonsignificant lower risk of breast cancer was observed for women who breastfed more than 3 children, for those who were < 25 years old at their first breastfeeding episode, and for women who had more than 1 child and had breastfed for > 72 months. Moreover, later age at menopause and later age at first full-term pregnancy were found to be associated with higher risk of breast cancer.

**METHODOLOGICAL ISSUES:** Both cases and controls were hospital-based, which may lower the generalizability of the results since authors do not include information about cancer cases that did not attend study hospitals.

---

***Furberg H, Newman B, Moorman P, Millikan R. Lactation and breast cancer risk. Int J Epidem 1999;28:396–402.***

**COUNTRY:** United States

**SETTING:** Not reported

**DESIGN:** Case-control, population-based study with data from the Carolina Breast Cancer Study (n = 751 cases, 742 controls)

**BREASTFEEDING DEFINITION**: Duration of breastfeeding, number of months of breastfeeding without menses. These variables were summed for all live births.

**OUTCOME MEASURE**: All women between the ages of 20 and 74 years who were diagnosed with a first, invasive breast cancer

**RESULTS**: Having breastfed was inversely associated with risk of breast cancer among parous women. The adjusted odds ratio for younger women (aged 20–49 years) was 0.8 (95% CI: 0.5–1.1), for older women (aged 50–74 years) was 0.7 (0.5–0.9), and for all women was 0.7 (0.5–0.8). Length of breastfeeding, timing of lactation, number of children breastfed, or number of months without periods while breastfeeding do not appear to influence risk.

**METHODOLOGICAL ISSUES:** Controls were frequency matched to cases by age and race (white and African-American). Analyses were performed separately according to age

groups; younger women (20–49 years old), older women (50–74 years old), and all women combined. Menopausal status was determined to be a confounding variable and controlled for. Overall response rates differed by case-control status and race of the participants. The authors rule out recall bias; however, they note that nurses who collected the data knew the case status of the participants, but argue that this was unlikely to introduce bias because a standardized questionnaire was used, and lactation history was not a main focus of the interview. Odds ratios were calculated using unconditional logistic regression models to study associations between different breastfeeding aspects (breastfeeding duration, number of children breastfed, ages at first and last lactation, months of amenorrhea, and use of lactation suppressants) and breast cancer. Adjustments of co-variates included age, race, parity, age at last full-term pregnancy, current body mass index, history of breast or ovarian cancer, and menopausal status.

---

***Marcus PM, Baird DD, Millikan RC, et al. Adolescent reproductive events and subsequent breast cancer risk. J Public Health 1999;89:1244–7.***

**COUNTRY:** United States

**SETTING:** Various counties in North Carolina (central and eastern regions)

**DESIGN:** Case-control population-based study of women aged 20–74 years. Cases (n = 862) were randomly obtained form the Carolina Breast Cancer Study, and controls (n = 790) were obtained from the Division of Motor Vehicles (for women < 65 years) and from Medicare records (women ≥ 65 years).

**BREASTFEEDING DEFINITION:** Ever versus never having breastfed and cumulative duration of breastfeeding

**OUTCOME MEASURE:** Breast cancer

**RESULTS:** Odds ratios were adjusted for race and age at diagnosis-selection. Breastfeeding before 20 years of age was associated with a significantly reduced risk of disease (OR = 0.2; 95% CI: 0.1–0.6), compared with women with no history of breastfeeding. The relationship persisted for women who breastfed for 1 year or longer and whose first pregnancy occurred before age 20 (OR = 0.1; 95% CI: 0.0–0.8). Multiparous women (greater than 2) produced similar results (data not shown).

**METHODOLOGICAL ISSUES:** A small number of women reported breastfeeding during their teen years. Results were only significant among premenopausal women.

---

***Newcomb PA, Egan KM, Titus-Ernstoff L, et al. Lactation in relation to postmenopausal breast cancer. Am J Epidemiol 1999;150(2):174–82.***

**COUNTRY:** United States

**SETTING:** Multicenter; statewide in Massachusetts (excluding Boston), New Hampshire, and Wisconsin

**DESIGN:** Case-control population-based study of postmenopausal women aged 50–79 years. Cases (n = 3,633) were selected from tumor registries with invasive breast carcinoma confirmed through histologic or cytologic

analyses; controls (n = 3,790) were randomly selected from licensed drivers and Medicare beneficiaries.

**BREASTFEEDING DEFINITION:** Ever breastfeeding compared to never breastfeeding and cumulative duration of breastfeeding

**OUTCOME MEASURE:** Invasive breast carcinoma in postmenopausal women

**RESULTS:** Breastfeeding was associated with a very modest reduction in the risk of breast cancer. Women who breastfed for at least 2 weeks had an adjusted relative risk of 0.87 (95% CI: 0.78–0.96), compared with women who never breastfed. The longer the total duration of breastfeeding in a lifetime, the greater the reduction in risk. Women who breastfed for ≥ 24 months had a relative risk of 0.73 (95% CI: 0.56–0.94). The inverse association between breastfeeding and breast cancer seems to persist throughout the postmenopausal period.

**METHODOLOGICAL ISSUES:** Retrospective recall bias may be an issue. To maintain blinding, information on the woman's screening practices and her personal and family history of breast cancer was not obtained until the end of the telephone interviews.

---

***Romieu I, Hernandez-Avila M, Lazcano E, Lopez L, Romero-Jaime R. Breast cancer and lactation history in Mexican women. Am J Epidemiol 1996;143(6):543–52.***

**COUNTRY:** Mexico

**SETTING:** Urban (Mexico City)

**DESIGN:** Case-control: cases (n = 349) were newly diagnosed with breast cancer; controls (n = 1,005) were selected from the general population. Lactation history was obtained before diagnosis of breast cancer.

**BREASTFEEDING DEFINITION:** Total duration of breastfeeding, ever breastfed, duration of breastfeeding for first and second live-born children

**RESULTS:** Breastfeeding was protective against breast cancer for both pre- and postmenopausal women. Parous women who had ever breastfed had a cancer risk of 0.47 (95% CI: 0.30–0.73), compared with parous women who had never breastfed. Duration of lactation was also associated with a reduction in breast cancer risk (test for trend $p < 0.005$). This protective effect was stronger in postmenopausal women. Among premenopausal women, no increase in protection was found after 3 months of breastfeeding. The duration of breastfeeding was particularly important for firstborn children. The duration of breastfeeding for the second child was shorter and significant only among postmenopausal women.

**METHODOLOGICAL ISSUES:** The high proportions of premenopausal women and long durations of breastfeeding among study subjects resulted in a large degree of statistical power to test the associations of interest.

---

***Brinton LA, Potischman NA, Swanson CA, Schoenberg JB, et al. Breastfeeding and cancer risk. Cancer Causes and Control 1995;6:199–208.***

**COUNTRY:** United States

**SETTING:** Three geographic regions (Atlanta, Georgia; Seattle, Washington, central New Jersey)

**DESIGN:** Case-control with a focus on premenopausal women (< 45 years): cases = 1,211 newly diagnosed with breast cancer (86% of eligible cases); controls = 1,120 contacted in the community through random digit dialing (67% of eligible)

**BREASTFEEDING DEFINITION:** Duration of exclusive breastfeeding, any breastfeeding, why breastfeeding discontinued, medications to inhibit breastfeeding

**RESULTS:** The overall findings are consistent with studies that have shown breastfeeding to be a weak protective factor for breast cancer. The relative risk for > 2 weeks of breastfeeding versus no breastfeeding was 0.87 (95% CI: 0.7–1.0). Longer durations were associated with decreased risk. The relative risk for > 36 months was 0.72 (95% CI: 0.5–1.1). The relative risk for > 72 weeks was 0.67 (95% CI: 0.4–1.1) (p for trend = 0.04). Subjects who were young at first lactation (< 22 years) had the lowest risk. Breastfeeding was associated with a greater reduction in risk among subjects with a family history of breast cancer (p for interaction = 0.03).

**METHODOLOGICAL ISSUES:** The study lacked statistical power in that durations of breastfeeding were short among most subjects.

---

***Mayberry RM. Age-specific patterns of association between breast cancer and risk factors in Black women, ages 20 to 39 and 40 to 54. Ann Epidemiol 1994;4:205–213.***

**COUNTRY:** United States

**DESIGN:** Case-control: among women < 40 years of age, cases (n = 177) were compared with controls (n = 137); among women aged 40–54 years cases (n = 313) were compared with controls (n = 348)

**BREASTFEEDING DEFINITION:** Total months of breastfeeding defined as follows: > 8 months, 4–7 months, and < 4 months

**RESULTS:** The adjusted odds ratio showed no association between breastfeeding and risk of breast cancer.

**METHODOLOGICAL ISSUES:** Small sample size may have limited the statistical power to detect an association.

---

***Newcomb PA, Storer BE, Longnecker MP, et al. Lactation and a reduced risk of premenopausal breast cancer. New Eng J Med 1994;330(2):81–7.***

**COUNTRY:** United States

**SETTING:** Wisconsin, Massachusetts, New Hampshire

**DESIGN:** Case-control (multicenter study): cases = 6,888 (81% of eligible cases); controls = 8,216 (82% of eligible controls)

**BREASTFEEDING DEFINITION:** Duration of breastfeeding (before cancer diagnosis), reasons for stopping breastfeeding, medications used to prevent lactation, age at first lactation

**RESULTS:** Among all parous women who had ever lactated, the estimated relative risk for breast cancer was 0.97, a nonsignificant difference. Among premenopausal women, a history of breastfeeding was associated with a slight decrease in risk of breast cancer. The relative risk is 0.78 (95% CI: 0.66–0.91). Total duration of breastfeeding was associated with a decrease in risk of breast cancer ($p < 0.001$) only among premenopausal women. Compared with women who never lactated, a cumulative total of > 24 months of breastfeeding was associated with a relative risk of 0.72. Age at first lactation had an independent effect on risk of breast cancer. Younger ages at first lactation were associated with a decreased risk (p for trend was 0.003). The authors conclude, "If women who do not breastfeed or who breastfeed for < 3 months were to do so for 4 to 12 months, breast cancer among parous premenopausal women could be reduced by 11 percent, judging from current rates. If all women with children lactated for 24 months or longer, however, then the incidence might be reduced by nearly 25 percent. This reduction would be even greater among women who first lactate at an early age."

**METHODOLOGICAL ISSUES:** The study had sufficient statistical power to detect differences in risk among premenopausal women.

---

***Kelsey JL, Gammon MK, John EM. Reproductive factors and breast cancer. Epidemiol Reviews 1993;15(1):36–47.***

**COUNTRY:** Multicountry

**SETTING:** Various

**DESIGN:** Review article of existing studies

**BREASTFEEDING DEFINITION:** Varies by study

**RESULTS:** This review article concludes that breastfeeding may reduce the risk of breast cancer among women under 50 years of age. Of the 10 case-control studies reviewed, 8 found an association between breastfeeding and reduced risk, and 2 failed to show an effect. Five of these studies found a small protective effect of ever breastfeeding but no trend of decreased risk with increased breastfeeding duration. Three studies found decreased risk in both pre- and postmenopausal women. Where a protective effect was found, the adjusted odds ratios ranged from 0.21 to 0.77. Of concern is the fact that 2 large prospective cohort studies have failed to find an association between breastfeeding and breast cancer risk. Although it would have been helpful, the authors do not discuss the difference in findings between case-control and prospective cohort studies. Cohort

studies generally are considered to be stronger than case-control studies, and the fact that 2 have now failed to confirm the protective effect found in case-control studies is troubling.

---

***Thomas DB, Noonan EA, WHO Collaborative Study of Neoplasia and Steroid Contraceptives. Breast cancer and prolonged lactation. Int J Epidem 1993;22(4):619–26.***

**COUNTRY:** Multinational case-control study (Australia, Germany, Israel, Chile, China, Colombia, Kenya, Mexico, Philippines, Thailand)

**SETTING:** Hospital

**DESIGN:** Case-control: cases (n = 2,336) were newly diagnosed breast cancer patients; controls (n = 14,900) were hospital patients not admitted for obstetric/gynecological reasons or for any condition associated with use of oral contraceptives

**BREASTFEEDING DEFINITION:** Duration of breastfeeding; women who breastfed < 3 months were used as the reference group

**RESULTS:** No significant protective effect of breastfeeding was found for any of the models examined. These models included pre- and postmenopausal women, age of diagnosis, women with different numbers of live births, or mean number of months that women breastfed each child. In premenopausal women and those with two or more live births, most risk estimates indicated a protective effect of breastfeeding > 6 months, compared with women who breastfed < 3 months, but none of these risk estimates was statistically significant.

**METHODOLOGICAL ISSUES:** The authors used women who had breastfed < 3 months as a reference group to avoid potentially confounding factors associated with unidentified risk factors that might occur if the comparison group consisted of women who had lactation failure. However, to avoid this bias, the authors may have inadvertently minimized their ability to find an effect in that many studies have shown that the protective effect of breastfeeding in premenopausal women occurs with short breastfeeding durations and is not increased with longer durations.

---

***Yoo K-Y, Tajima K, Kuroishi T, Hirose K, et al. Independent protective effect of lactation against breast cancer: A case-control study in Japan. Am J Epidemiol 1992;135(7):726–33.***

**COUNTRY:** Japan

**SETTING:** Nagoya Aichi Cancer Center Hospital

**DESIGN:** Case-control: cases = 521 confirmed by histological and clinical exam; controls = 521 women with no history of breast cancer selected from the hospital

**BREASTFEEDING DEFINITION:** Any breastfeeding, total number of breastfed children, average months of breastfeeding each child

**RESULTS:** Among parous women, the adjusted odds ratio of breast cancer among women with a positive history of breastfeeding was 0.62 (95% CI: 0.37–1.04) compared with no breastfeeding. A significant trend of decreased risk of breast cancer with increased average months of breastfeeding was observed ($p < 0.05$) among premenopausal women only. Premenopausal women who had lactated for 7–9 months showed the lowest risk of breast cancer (adjusted odds ratio = 0.39, 95% CI: 0.15–0.97).

**METHODOLOGICAL ISSUES:** Controls were selected from a hospital-based population and hence may not be representative of the community. There was good simultaneous adjustment for age, parity, and menopausal status. The study also restricted the analyses to parous women, which is important because of the importance of age of first pregnancy on risk of breast cancer.

---

***London SJ, Colditz GA, Stampfer MJ, et al. Lactation and risk of breast cancer in a cohort of US women. Am J Epidemiol 1990;132(1):17–26.***

**COUNTRY:** United States

**SETTING:** Multistate (11 larger US states)

**DESIGN:** Prospective for cancer outcomes; however, breastfeeding history was obtained retrospectively; n = 89,413 parous female nurses aged 30–55 years

**BREASTFEEDING DEFINITION:** Never breastfed, breastfed for the following lengths of time: <1 month, 1–3 months, 4–6 months, 7–11 months, 12–17 months, 18–23 months, 24–35 months, 36–47 months, > 48 months, unknown

**RESULTS:** No association between lactation and risk of breast cancer was found.

**METHODOLOGICAL ISSUES:** The study controlled for the possibility that breast cancer reduced breastfeeding. Short breastfeeding duration among the population (only 6% breastfed > 24 months) may have reduced the size of the effect.

---

***Layde PM, Webster LA, Baughman AL, et al. The independent associations of parity, age at first full term pregnancy, and duration of breastfeeding with risk of breast cancer. J Clin Epidemiol 1989;42(10):963–73.***

**COUNTRY:** United States

**SETTING:** Multi-center

**DESIGN:** Case-control: cases (n = 4,599) were newly diagnosed with breast cancer; controls (n = 4,536) were women of similar age selected at random from the community

**BREASTFEEDING DEFINITION:** Total duration of breastfeeding

**RESULTS:** Compared with parous women who never breastfed, breastfeeding was protective against breast cancer. A dose-response relationship was found: the risk of breast cancer decreased with increasing duration of breastfeeding (p for trend < 0.01). The odds ratio for never having breastfed compared with breastfeeding for more than 24 months was 0.67.

**METHODOLOGICAL ISSUES:** This study controlled for many potentially confounding factors and tested for interactions.

---

***Siskind V, Schofield F, Rice D, Bain C. Breast cancer and breastfeeding: Results from an Australian case-control study. Amer J Epidemiol 1989;130(2):229–36.***

**COUNTRY:** Australia

**SETTING:** Brisbane and suburbs

**DESIGN:** Case-control: cases = 459; control = 1,091

**BREASTFEEDING DEFINITION:** Total duration of breastfeeding, average duration per live-born child, total number of children breastfed, average number of children breastfed, length of time first liveborn child was breastfed

**RESULTS:** A weak inverse association between history of breastfeeding and breast cancer was found. However, none of the risk estimates or overall tests of association between breastfeeding and breast cancer was statistically significant.

**METHODOLOGICAL ISSUES:** The study had limited statistical power to detect differences, particularly for premenopausal women.

---

***Rosero-Bixby L, Oberle MW, Lee NC. Reproductive history and breast cancer in a population of high fertility, Costa Rica, 1984–1985. Int J Cancer 1987;40:747–54.***

**COUNTRY:** Costa Rica

**SETTING:** Nationwide

**DESIGN:** Case-control: cases (n = 171) were interviewed within 3 years of diagnosis; controls (n = 826) were selected from the general population

**BREASTFEEDING DEFINITION:** Total duration of breastfeeding

**RESULTS:** After controlling for parity, the duration of breastfeeding had no association with risk of breast cancer.

**METHODOLOGICAL ISSUES:** The number of cases was small, which may have limited statistical power to detect an association.

---

***Byers T, Graham S, Rzepka T, Marshall J. Lactation and breast cancer. Amer J Epidemiol 1985;121(5):664–74.***

**COUNTRY:** United States

**SETTING:** Urban

**DESIGN:** Case-control: cases = 453 newly diagnosed cases; controls = 1,365 women selected randomly in the community

**BREASTFEEDING DEFINITION:** Duration of breastfeeding, number of infants breastfed, reasons for stopping breastfeeding

**RESULTS:** The results show a negative association between breastfeeding and breast cancer among premenopausal women only. The relative risk for 12 months of lactation was 0.6 ($p < 0.01$). A dose-response was detected with increasing durations of breastfeeding (p for trend = 0.07). Women's reports of insufficient milk were associated with increased risk for breast cancer, especially in premenopausal women, but when controlled for in multiple logistic regression, there was only a slight reduction in the association between breastfeeding duration and the risk of breast cancer.

**METHODOLOGICAL ISSUES:** This is the first study to raise the issue that a third factor may be related to both difficulty in breastfeeding, which is perceived by mothers to be insufficient milk, and breast cancer. If this were the case, then breastfeeding may not be protective of breast cancer, but rather a marker that the third factor related to breast cancer is not present. Many subsequent studies have attempted to address failure to breastfeed as a physiological marker of risk rather than as a behavioral choice.

---

***Raksasook S. The relationship of breast cancer with parity and breast feeding in Thai women. Southeast Asian J Surgery 1985;8(1):23–30.***

**COUNTRY:** Thailand

**SETTING:** Phyathai area in Bangkok

**DESIGN:** Case-control: women were divided into 3 groups: normal (n = 825); benign breast disease (n = 162); and breast cancer (n = 109)

**BREASTFEEDING DEFINITION:** Ever breastfed, duration of breastfeeding

**RESULTS:** In contrast to all of the other studies reviewed, women with breast cancer were more likely to have breastfed and, among breastfeeding women, to have breastfed longer than controls did, but these associations were not tested for statistical significance.

**METHODOLOGICAL ISSUES:** Associations were not tested for statistical significance.

---

***Brinton LA, Hoover R, Fraumeni JF. Reproductive factors in the aetiology of breast cancer. Br J Cancer 1983;47:757–62.***

**COUNTRY:** United States

**SETTING:** Urban

**DESIGN:** Case-control: cases = 1,362; controls = 1,250

**BREASTFEEDING DEFINITION:** Any breastfeeding, number of breastfeeding children

**RESULTS:** The results show no association between breastfeeding history and risk of breast cancer. The adjusted relative risk among women who ever breastfed was 0.94, in comparison with women who never breastfed, but this risk was not statistically significant (95% confidence interval: 0.8–1.1).

**METHODOLOGICAL ISSUES:** No information on breastfeeding duration was available. Small sample size may have limited statistical power.

---

***MacMahon B, Purde M, Cramer D, Hint E. Association of breast cancer risk with age at first and subsequent births: A study in the population of the Estonian Republic. J Natl Cancer Inst 1982;69(5):1035–8.***

**COUNTRY:** Estonian Republic

**SETTING:** Urban (Tallinn and Tartu)

**DESIGN:** Case-control: cases = 362 newly diagnosed cases; controls = 694 women participating in a gynecological screening program

**BREASTFEEDING DEFINITION:** Duration of breastfeeding categorized as follows: 0, 1–6, 7–12, 13–24, > 25 months

**RESULTS:** Breastfeeding duration did not have any effect on breast cancer.

**METHODOLOGICAL ISSUES:** Cases and controls differed in age distributions, with the cases being older than the controls. This study may have lacked statistical power to detect an effect because of the relatively short durations of breastfeeding. Breastfeeding association analyses were restricted to women who had only 1 or 2 live births.

---

***Kalache A, Vessery MP, McPherson K. Lactation and breast cancer. Br Med J 1980 (Jan 26);280(6209):223–4.***

**COUNTRY:** England

**SETTING:** Eight teaching hospitals in London and Oxford

**DESIGN:** Case-control of 707 married women aged 16–50 years

**BREASTFEEDING DEFINITION:** Ever breastfeeding, breastfeeding for more than 16 weeks, and mean duration of breastfeeding

**RESULTS:** No significant differences in breastfeeding behaviors were found between cases and controls, suggesting no relationship between breastfeeding and the risk of breast cancer.

**METHODOLOGICAL ISSUES:** No information was provided to compare case and control groups.

---

***Ing R, Ho JHC, Petrakis NL. Unilateral breast-feeding and breast cancer. Lancet 1977 (July 16): 124–7.***

**COUNTRY:** Hong Kong

**SETTING:** Fishing villages in Southern China

**DESIGN:** Retrospective (n = 2403): Chinese breast cancer patients, including 73 women who had breastfed from one breast only

**BREASTFEEDING DEFINITION:** Number of children breastfed, average duration of breastfeeding, history of breastfeeding with only one breast, relative use of both breasts during breastfeeding

**RESULTS:** The unsuckled breast among women who only breastfed on one side had a 4-fold increase in cancer risk in postmenopausal older women (> 55 years of age).

**METHODOLOGICAL ISSUES:** Tests of significance are not provided. Only mothers who suckled on one side "for convenience or custom" were included, reducing the likelihood of reverse causality (avoidance of a predisposed breast).

---

***MacMahon B, Lin TM, Lowe CR, et al. Lactation and cancer of the breast: A summary of an international study. Bull WHO 1970;42:185–194.***

**COUNTRY:** Multicountry (United States, England, Greece, Slovenia, Yugoslavia, Brazil, Japan, Taiwan)

**SETTING:** Hospital-based populations

**DESIGN:** Case-control: cases (n = 4,395) were newly diagnosed breast cancer patients; controls (n = 12,888) were selected from the hospital

**BREASTFEEDING DEFINITION:** Number of parous women who never breastfed, mean duration of breastfeeding among those children who breastfed, number of women with long lifetime histories of lactation (the precise cutoff depended on the country)

**RESULTS:** No consistent differences in duration of lactation were found between women with breast cancer and those without breast cancer, after controlling for parity.

**METHODOLOGICAL ISSUES:** Use of hospital-based controls may have introduced undetected bias in the study.

---

***Valaoras VG, MacMahon B, Trichopoulos D, Polychronopoulou A. Lactation and reproductive histories of breast cancer patients in greater Athens, 1965–69. Int J Cancer 1969;4:350–63.***

**COUNTRY:** Greece

**SETTING:** Urban (Athens and Piraeus)

**DESIGN:** Case-control: cases (n = 799) were newly diagnosed breast cancer patients; controls (n = 2,470) were selected from the hospital

**BREASTFEEDING DEFINITION:** Number of parous women who never breastfed, mean duration of breastfeeding among those children who breastfed, number of women who breastfed > 24 months

**RESULTS:** Although the associations are in the direction of a protective effect of breastfeeding, the differences are small and not statistically significant, even for long durations of breastfeeding.

**METHODOLOGICAL ISSUES:** Substantial differences present between the cases and the control groups on several pertinent variables, such as demographics, marital status, birthplace of the study groups, and number of stillborn children.

---

***MacMahon B, Feinleib M. Breast cancer in relation to nursing and menopausal history. J Nat Cancer Inst 1960;24:733–53.***

**COUNTRY:** United States

**SETTING:** New York city hospitals (5)

**DESIGN:** Case-control: cases (n = 340) were selected from current cancer lists; controls (n = 340) were general surgical patients matched for 8 variables

**BREASTFEEDING DEFINITION:** Total duration of breastfeeding, average duration of breastfeeding per child, proportion of mothers who have never breastfed, proportion of children who have been breastfed

**RESULTS:** No consistent differences in duration of lactation were found between women with breast cancer and those without breast cancer, after controlling for potentially confounding factors.

**METHODOLOGICAL ISSUES:** No examinations, other than race, religious tendencies, marital status, and native or foreign born, were presented comparing cases and controls. Moreover, cases and controls were not completely matched for parity.

---

## 5.2 Effect of Breastfeeding on Maternal Risk of Ovarian Cancer

***Ness RB, Grisso JA, Cottrea C, et al. Factors related to inflammation of the ovarian epithelium and risk of ovarian cancer. Epidemiology 2000;11:111–17.***

**COUNTRY:** United States

**SETTING:** Delaware Valley area (including counties in eastern Pennsylvania, southern New Jersey, and Delaware)

**DESIGN:** Case-control population-based study design of 20–69 year old women: cases (n = 767) were identified from 39 hospitals and histologically confirmed as borderline or invasive epithelial ovarian cancer; controls (n =1,367) were selected from the community by random digit dialing and frequency matched by 5-year age groups

**BREASTFEEDING DEFINITION:** Any breastfeeding, total months of breastfeeding

**OUTCOME MEASURE:** Ovarian cancer

**RESULTS:** Breastfeeding for 24 months or more (cumulative) was associated with reduced risk of ovarian cancer. The adjusted odds ratio of women who breastfed ≥ 24 months was 0.6 (95% CI: 0.4–1.0). Other factors associated with reduced risk of ovarian cancer were higher parity and use of oral contraceptives, both of which, like breastfeeding, suppress ovulation.

**METHODOLOGICAL ISSUES:** Recall bias may be an issue, especially among the older women. Low participation rate (61% response rate), especially among the cases, may be an issue.

---

***Siskind V, Green A, Bain C, Purdie D. Breastfeeding, menopause, and epithelial ovarian cancer. Epidemiology 1997;8(2):188–91.***

**COUNTRY:** Australia

**SETTING:** Queensland, New South Wales, and Victoria

**DESIGN:** Case-control study (n > 600 parous ovarian cancer patients, aged 18–79 years; cases (n = 619) were obtained from major oncology treatment centers in the three Australian states; controls (n = 724) were obtained randomly from the electoral rolls.

**BREASTFEEDING DEFINITION:** Duration of exclusive breastfeeding: full breastfeeding if unsupplemented by formula or solids, partial if supplemented. Only considered full breastfeeding.

**OUTCOME MEASURE:** Epithelial ovarian cancer registered in oncology treatment centers in the mentioned sites

**RESULTS:** A modest protective effect of prolonged breastfeeding was found on the risk of epithelial ovarian cancer among premenopausal women (adjusted odds ratio 0.98; 95% CI = 0.95–1.01). No such association was found among postmenopausal women (adjusted odd ratio 1.00; 95% CI = 0.9-–1.01) or between ovarian cancer and the length of time first live-born child was breastfed.

**METHODOLOGICAL ISSUES:** Authors controlled for parity (live births only) and other potential confounders. Generalizability might be an issue, since cases came from only 3 Australian states.

---

***Rosenblatt KA, Thomas DB, WHO Collaborative Study of Neoplasia and Steroid Contraceptives. Lactation and the risk of epithelial ovarian cancer. Int J Epidem 1993;22:192–7.***

**COUNTRY:** Australia, Chile, China, Israel, Mexico, Philippines, Thailand

**SETTING:** Hospital patients

**DESIGN:** Case-control: cases = 393 newly diagnosed cases; controls = 2,565 women hospitalized in the same hospital for digestive or nervous system disorders

**BREASTFEEDING DEFINITION:** Duration of breastfeeding

**OUTCOME MEASURE:** Ovarian cancer

**RESULTS:** Risk of ovarian cancer decreased with increasing duration of breastfeeding, but after adjusting for the number of live births, this trend was not significant. A significant reduction in risk was found for women who breastfed for at least 2 months, but no further reduction was found with longer-term breastfeeding. The findings are consistent with those of a meta-analysis of 12 studies that showed a slight reduction in risk associated with short-term breastfeeding and no further reduction in risk associated with longer term lactation (see Whittemore et al., 1992).

**METHODOLOGICAL ISSUES:** Analyses were restricted to parous women only, which is important because pregnancy has an independent protective effect on ovarian cancer risk. Potentially confounding factors were controlled as well.

---

***Whittemore AS, Harris R, Itnyre J, Collaborative Ovarian Cancer Group. Characteristics relating to ovarian cancer risk: Collaborative analysis of 12 US case-control studies. Am J Epidemiol 1992;136:1184–1203.***

**COUNTRY:** United States

**SETTING:** Community and hospital

**DESIGN:** Case-control: used data from 2,197 ovarian cancer patients and 8,893 controls from 12 case-control studies (6-hospital-based, 6 community-based)

**BREASTFEEDING DEFINITION:** Duration of breastfeeding

**OUTCOME MEASURE:** Ovarian cancer

**RESULTS:** After adjusting for parity and oral contraceptive use, parous women who had ever breastfed had a lower risk than did those who had never breastfed. The odds ratios were 0.73 (95% CI: 0.51–1.0) in the hospital studies and 0.81 (95% CI: 0.68–0.95) in the community-based studies. The percent of risk reduction per month of breastfeeding for the first 6 months after delivery exceeds that for breastfeeding after 6 months. This suggests that part of the protective effect of breastfeeding may be through suppression of ovulation. There was also a trend of decreasing risk with increasing duration of breastfeeding.

**METHODOLOGICAL ISSUES:** Analyses were restricted to parous women only, which is important because pregnancy has an independent protective effect on ovarian cancer risk. Potentially confounding factors were controlled as well.

---

***Gwinn ML, Lee NC, Rhodes PH, Layde PM, Rubin GL. Pregnancy, breast feeding, and oral contraceptives and the risk of epithelial ovarian cancer. J Clin Epidemiol 1990;43(6):559–68.***

**COUNTRY:** United States

**SETTING:** Multicenter (Atlanta, Detroit, San Francisco, Seattle, Connecticut, Iowa, New Mexico, Utah)

**DESIGN:** Case-control: n = 436 cases and 3,833 controls randomly selected from the community

**BREASTFEEDING DEFINITION:** Any breastfeeding, total months of breastfeeding

**OUTCOME MEASURE:** Ovarian cancer

**RESULTS:** Among parous women, breastfeeding was protective against ovarian cancer. The relative risk was 0.6 (95% CI: 0.5–0.9). Further reductions in risk were seen in women who had breastfed for > 24 month. Each month of breastfeeding was associated

with a reduced risk of 2.4 percent. Most of the protection due to breastfeeding occurred with the first exposure.

**METHODOLOGICAL ISSUES:** The parity variable included live and stillbirths, unlike other studies, which only include live births in the analyses.

---

***Booth M, Beral V, Smith P. Risk factors for ovarian cancer: A case-control study. Br J Cancer 1989;60:592–8.***

**COUNTRY:** England

**SETTING:** London and Oxford hospitals (13)

**DESIGN:** Case-control: cases (n=235) and controls (n=451) were selected from the hospital.

**BREASTFEEDING DEFINITION:** Duration of breastfeeding, ever breastfed

**OUTCOME MEASURE:** Ovarian cancer

**RESULTS:** In contrast to the results from the other studies reviewed, women who had breastfed for more than 2 years had 3 times the risk of ovarian cancer of women who never breastfed ($p < 0.05$).

**METHODOLOGICAL ISSUES:** Controls were selected from the hospital, which may have introduced undetected bias.

---

***Risch HA, Weirs NS, Lyon JL, Daling JR, Lift JM. Events of reproductive life and the incidence of epithelial ovarian cancer. Am J Epidemiol 1983;117(2):128–39.***

**COUNTRY:** United States

**SETTING:** Washington and Utah (six counties)

**DESIGN:** Case-control: n = 290 cases (68% of eligible cases), n = 705 controls randomly selected from the community and age-matched

**BREASTFEEDING DEFINITION:** Total months of breastfeeding, 0–2 months or >3 months

**RESULTS:** The estimated relative risk for breastfeeding was 0.79 per year of lactation ($p = 0.034$). Breastfeeding more than 3 months, compared with 2 or fewer months, was inversely associated with ovarian cancer: relative risk = 0.694 (95% CI: 0.503–0.959; $p = 0.026$). The authors found that the magnitudes of the diminished risk from lactation and other protective exposures (e.g., pregnancies and oral contraceptives) substantially exceeded those that would have been expected solely on the basis of their inhibition of ovulation. This suggests another mechanism by which these events protect against ovarian cancer.

**METHODOLOGICAL ISSUES:** Only 67% of eligible cases were included, which suggests that the results may not be representative of women with advanced cases of cancer. The study controlled for many potentially confounding factors.

---

## 5.3 Effect of Breastfeeding on Other Maternal Outcomes

***Dewey KG, Cohen RJ, Brown KH, et al. Effects of exclusive breastfeeding for four versus six months on maternal nutritional status and infant motor development: Results of two randomized trials in Honduras. J Nutr 2001, 131:262–7.***

**COUNTRY:** Honduras

**SETTING:** Maternity hospitals in San Pedro Sula

**DESIGN:** Prospective observational study for the first 4 months of life, followed by a randomized intervention trial from 4 to 6 months and a follow-up period for the second half of the first year

**BREASTFEEDING DEFINITION:** Exclusive breastfeeding consisted of infants receiving only breastmilk.

**OUTCOME MEASURE:** Maternal body mass index, duration of lactational amenorrhea, and infant motor development (following 10 motor milestones)

**RESULTS:** Women who exclusively breastfed 4–6 months experienced small but significantly more postpartum weight loss and longer duration of postpartum amenorrhea than women who introduced solids at 4 months. Moreover, the nutritional burden or nutritional cost of the mothers who were exclusively breastfeeding was only slightly higher than that of women who introduced solid foods at 4 months.

**METHODOLOGICAL ISSUES:** All groups in both studies were exclusively breastfed until the age of 4 months and continued to receive some breastmilk past 6 months. Since neither study had a formula-only group, it can be assumed that the developmental differences observed would be stronger between the exclusively breastfed and the formula-fed infants.

---

***Gigante D, Victora CG, Barros FC. Breast-feeding has a limited long-time effect on anthropometry and body composition of Brazilian mothers. J Nutr 2001;131:78–84.***

**COUNTRY:** Brazil

**SETTING:** Urban

**DESIGN:** Longitudinal study: n = 312

**BREASTFEEDING DEFINITION:** Not specified, but referred to the breastfeeding patterns classified according to Labbok and Krasovec (Stud Fam Plann 1990; 21:226–30).

**OUTCOME MEASURE:** Maternal anthropometric measures: body mass index (BMI), waist:hip ratio, waist circumference, percent fat mass, body mass index gain, weight gain, arm fat index, fat mass change after 5–6 years

**RESULTS:** All anthropometric values tended to be higher for women who breastfed for < 1 month or ≥ 12 months. Women who breastfed 6–11.9 months had the smallest BMI, percent fat mass, and skinfold measurements. Moreover, women who exclusively or predominantly breastfed their infants tended to be thinner than those who breastfed partially or not at all.

**METHODOLOGICAL ISSUES:** Breastfeeding duration information was collected at 6 and 12 months. Confounding variables, such as income, education, age, parity, and prepregnancy weight and BMI were taken into account during the multivariate analyses. ANOVA bivariate analyses were conducted to compare the mean anthropometric values with breastfeeding duration and pattern.

---

***Michaëlson K, Baron JA, Farahmand BY, et al. Influence of parity and lactation on hip fracture risk. Am J Epidemiol 2001;153(12):1166–72.***

**COUNTRY:** Sweden

**SETTING:** Nationwide

**DESIGN:** Population-based case-control among postmenopausal women aged 50–81 years of age: cases (n = 1,328) were determined by mailed questionnaires; controls (n = 3,312) were randomly selected.

**BREASTFEEDING DEFINITION:** Duration of breastfeeding was divided into 4 categories defined by quartiles of either total duration or mean duration per child (1–5 mo, 6–10 mo, 11–16 mo, > 16 mo total).

**OUTCOME MEASURE:** Incidence of hip fracture

**RESULTS:** Long total duration of breastfeeding was associated with a reduction in hip fracture risk, but the association disappeared when adjustments were made. No substantial risk differences were found considering mean duration of breastfeeding per child or among those with their first pregnancy as teenagers or after age 30. Increased parity among nonoral contraceptive users was associated with a modest reduction in risk of hip fracture.

**METHODOLOGICAL ISSUES:** This study was carried out only on postmenopausal women through mailed and telephone interviews. Possible confounders were age, oral contraceptive use, and parity.

---

***Motil KJ, Shen HP, Kertz BL, et al. Lean body mass of well-nourished women is preserved during lactation. Am J Clin Nutr 1998;67:292–300.***

**COUNTRY:** United States

**SETTING:** Not reported

**DESIGN:** Longitudinal: six-week interval observations between 6 and 24 weeks postpartum and at 52 weeks postpartum

**BREASTFEEDING DEFINITION:** Lactating women exclusively breastfed from birth to 6 months and gradually weaned their infants from 6 to 12 months.

**OUTCOME MEASURE:** Lean body mass, body weight, dietary protein intakes, milk production, and milk protein output of women in the lactating, nonlactating postpartum, and nulliparous groups

**RESULTS:** Lactating women had significantly more body fat than the nulliparous women only at the first 3 visits (up to 18 weeks postpartum, but not the fourth [24 weeks]). None

of the skinfold thicknesses differed significantly for the lactating, nonlactating, or nulliparous women at the fifth visit (1 year). Lean body mass was preserved in well-nourished lactating women who exclusively breastfed for the first 6 months of life, but small progressive body weight losses were observed throughout the breastfeeding period.

**METHODOLOGICAL ISSUES:** Sample size (n = 30) was small. Body composition was determined at all visits, body fat was calculated, dietary consumption was determined with 3-day food records (including 1 weekend day), and milk production was measured for 50 hours by test-weighing. Differences among women were determined with analysis of variance and analysis of co-variance.