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Cancers attributable to reproductive factors in the UK in 2010

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Reproductive factors influence the risk of cancers of the female genital tract (uterus and ovary) and breast. The following reproductive factors are important in this respect: age at menarche; age at first birth; parity; age at menopause; and duration of breastfeeding. The effects of exogenous hormones are described in Section 10.

Age at menarche

Early age at menarche has been consistently associated with an increased risk of breast and endometrial cancer (Pike *et al*, 2004). Relative risk (RR) for premenopausal breast cancer is reduced by an estimated 7% for each year that menarche is delayed after age 12 years, and by 3% for post-menopausal breast cancer (Clavel-Chapelon, 2002). The effect on risk is through prolongation of the period with relatively high exposure to endogenous oestrogen.

Age at first birth

The younger the woman is when she begins childbearing, the lower her risk of breast cancer (Kelsey *et al*, 1993). The RR of developing breast cancer increases by 3% for each year of delay (Collaborative Group, 2002).

Parity

Increasing parity reduces the risk of breast, endometrial and ovarian cancers (Pike *et al*, 2004). The higher the number of full-term pregnancies, the greater the protection. Compared with nulliparous women, a woman who has at least one full-term pregnancy reduces her risk of breast cancer by around 25% (Layde *et al*, 1989; Ewertz *et al*, 1990) and women with five or more children experience a 50% reduction in risk (Kelsey *et al*, 1993). For endometrial cancer, risk is reduced by 30% for a woman's first birth and by 25% for each successive birth, and later maternal age at last birth has also been shown to reduce the risk (Pike *et al*, 2004). For ovarian cancer, risk in women with four pregnancies is only 40% that in nulliparous women (Ness *et al*, 2002). However, increasing parity increases the risk of cancer of the cervix, independently of any increase in the prevalence of infection with HPV (Munoz *et al*, 2002).

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Age at menopause

Late menopause increases the risk of breast cancer and endometrial cancer (Pike *et al*, 2004). For breast cancer, risk is doubled for a woman with menopause at 55 years compared with less than 45 years (Kelsey *et al*, 1993). For each year that the menopause is delayed, there is an approximate 3% increase in breast cancer risk (Collaborative Group, 1997). Postmenopausal women have a lower risk of breast cancer compared with premenopausal women of the same age, both for natural menopause and for menopause induced through surgery (Collaborative Group, 1997).

Breastfeeding

The role of breastfeeding as a protective factor against the later development of breast cancer has been long suspected (Lane-Claypon, 1926). More recently, this association has been confirmed and the magnitude of the effect estimated as a decrease in risk of 4.3% for every 12 months of breastfeeding (Collaborative Group on Hormonal Factors in Breast Cancer, 2002). For ovarian cancer, the issue is less clear. An early collaborative analysis of case–control studies found a reduced risk in parous women who had ever breastfed compared with those who had never done so (Whittemore *et al*, 1992). Subsequent work suggested that only serous tumours may be so influenced (Jordan *et al*, 2007, 2008). A recent analysis of two US cohort studies (Danforth *et al*, 2007) suggests that each month of breastfeeding reduces the RR by 2% (RR = 0.98 per month, 95% CI 0.97 – 1.00).

Although a woman's reproductive behaviour can influence the risk of cancers of the uterus, ovary and breast, most of the important aspects discussed above are not sensibly considered as targets for preventive interventions.

In this section, therefore, only the cancers attributable to sub-optimal levels of breastfeeding are evaluated.

METHODS

Breastfeeding of infants in Britain is not very common, and is generally not prolonged for more than a few weeks. Surveys of infant feeding in the UK, at 5-yearly intervals since 1975, have been carried out by the Department of Health. The most recent survey (the seventh) was in 2005 (Bolling *et al*, 2007). Table 1 shows the results of these surveys.

Table 1 Percentage of women breastfeeding at given intervals post partum (Great Britain)

Interval post partum	% Women breastfeeding, by year of survey					
	1980	1985	1990	1995	2000	2005
Birth	65	63	62	66	69	76
1 Week	*54*	*52*	*51*	56	55	63
2 Weeks	*51*	*49*	*48*	53	52	60
6 Weeks	*41*	*39*	*39*	42	42	48
4 Months	*27*	*27*	*26*	27	28	34
6 Months	*21*	*20*	*20*	21	21	25
8 Months	*15*	*14*	*14*	15	16	*21*
9 Months	*14*	*13*	*13*	14	13	18

Values in italics have been interpolated.

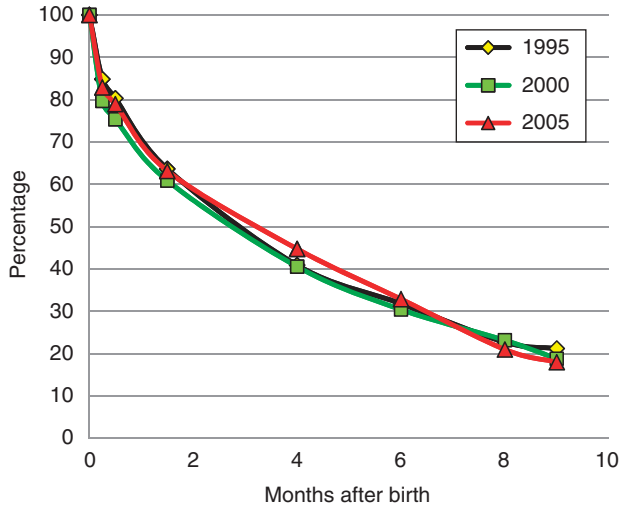

Figure 1 Percent of women continuing breastfeeding, by time since birth.

The values in italics have been interpolated. This seems relatively secure, as the decline in breastfeeding prevalence with time since birth in women who do actually commence seems to be relatively constant (Figure 1).

There is no generally accepted target for breastfeeding. The Global Strategy on Diet, Physical Activity and Health of the World Health Organisation (WHO, 2004) includes a recommendation to 'promote and support exclusive breastfeeding for the first six months of life and promote programmes to ensure optimal feeding for all infants and young children'. Therefore, we have taken as the optimum breastfeeding of all live-born children for six months, with no change to the current pattern after this time. Currently, some 18% of women are breastfeeding to 9 months of age (Table 1).

Table 2 gives information on the birth experience of women in England and Wales in 2008, the most recent year available (Office for National Statistics, 2009).

Table 3 shows the estimated duration of breastfeeding (based on the data of Table 1).

With a change in risk for each month of breastfeeding of −0.366% for breast cancer and −2.0% for ovarian cancer (Collaborative Group on Hormonal Factors in Breast Cancer, 2002; Danforth *et al*, 2007), the actual protection provided by the breastfeeding practices of each generation of women can be estimated (column 1 of Table 4). The breastfeeding practices from

Table 2 Natality of women in England and Wales in 2008, by age/birth cohort

Age (years)	Central birth year	Average number of live-born children	Average age when 50% children had been born	Average year when 50% children had been born
0–4	2006	0	—	—
5–9	2001	0	—	—
10–14	1996	0	—	—
15–19	1991	0.04	13	2004
20–24	1986	0.34	19	2003
25–29	1981	0.80	23	2001
30–34	1976	1.34	26	1999
35–39	1971	1.75	26	1996
40–44	1966	1.90	26	1991
45–49	1961	1.96	27	1985
50–54	1956	2.02	26	1980
55–59	1951	2.04	25	1974
60–64	1946	2.19	25	1968
65–69	1941	2.34	25	1964
70–74	1936	2.40	26	1960
75–79	1931	2.35	27	1956
80–84	1926	2.12	27	1951
⩾85	1921	2.00	27	1946

Table 3 Median and mean duration of breast feeding (Great Britain)

Average	Duration of breastfeeding (months) by year of survey					
	1980	1985	1990	1995	2000	2005
Median	0.60	0.48	0.38	0.84	0.71	1.46
Mean	2.84	2.75	2.71	2.89	2.90	3.50
Mean if all ⩾6 months[a]	6.78	6.75	6.74	6.79	6.78	7.02

[a]Mean if all women could breastfeed their children for 6 months (so prevalence at 6 months is 100%).

Table 1 are assumed to apply to the year in which 50% of the children in a given age group in 2008 would have been born. Since there are no data on breastfeeding practices prior to 1980, the duration of having been breastfed for women in the age groups ⩾55–59 are taken to be the same as in 1980.Table 3 also shows the estimated mean duration of breastfeeding if all women could breastfeed their children for 6 months (so that prevalence at 6 months is 100%), after which the values in Table 1 continue to pertain.

RESULTS

Column 1 of Table 4 shows the decrease in risk of breast and ovarian cancer due to breastfeeding, of women in the UK, by age group, in 2008, and column 2 the decrease in risk if all had been breastfed for a minimum of 6 months. Column 3 shows the excess risk of women in 2008, due to their breastfeeding practice being short of target, and column 4 the population-attributable fraction of breast and ovarian cancer cases by age.

In Table 5, we assume that the RR estimated for 2008 is pertinent for 2010, and show the actual numbers of cancer cases that would be attributable to breastfeeding practices not reaching the optimum level.

In total 2699 cancer cases projected to occur in 2010 (1498 breast cancers, 1201 ovarian cancers) would have been avoided if breastfeeding practice had been at the theoretical 'optimum'. This

Table 4 Effect of breastfeeding on women's risk of breast and ovarian cancer, UK 2008

	Breast cancer				Ovarian cancer			
	1	2	3	4	1	2	3	4
Age (years)	Estimated individual decrease in risk	Target decrease in risk[a]	Excess risk	PAF (%)	Estimated individual decrease in risk	Target decrease in risk[a]	Excess risk	PAF (%)
0–4	—	—	0	—	—	—	0	—
5–9	—	—	0	—	—	—	0	—
10–14	—	—	0	—	—	—	0	—
15–19	0.0005	0.0010	0.001	0.1	0.0026	0.0052	0.003	0.3
20–24	0.0043	0.0086	0.004	0.4	0.0219	0.0443	0.022	2.3
25–29	0.0084	0.0196	0.011	1.1	0.0429	0.1010	0.058	6.1
30–34	0.0140	0.0328	0.019	1.9	0.0718	0.1691	0.097	10.5
35–39	0.0183	0.0429	0.025	2.5	0.0935	0.2212	0.128	14.1
40–44	0.0186	0.0463	0.028	2.8	0.0951	0.2387	0.144	15.9
45–49	0.0195	0.0478	0.028	2.9	0.0997	0.2466	0.147	16.3
50–54	0.0207	0.0495	0.029	2.9	0.1060	0.2550	0.149	16.7
55–59	0.0209	0.0500	0.029	3.0	0.1071	0.2575	0.150	16.8
60–64	0.0225	0.0536	0.031	3.2	0.1149	0.2764	0.161	18.2
65–69	0.0240	0.0573	0.033	3.4	0.1228	0.2953	0.173	19.7
70v74	0.0246	0.0588	0.034	3.5	0.1260	0.3029	0.177	20.2
75–79	0.0241	0.0576	0.033	3.4	0.1233	0.2966	0.173	19.8
80–84	0.0217	0.0519	0.030	3.1	0.1113	0.2676	0.156	17.6
⩾85	0.0205	0.0490	0.028	2.9	0.1050	0.2524	0.147	16.5

Abbreviation: PAF = population-attributable fraction. [a]If all had breastfed for a minimum of 6 months.

Table 5 Cases of breast and ovarian cancer estimated to be due to sub-optimal breast feeding, UK 2010

	Breast				Ovary			
Age (years)	Relative risk	Observed cases	Excess attributable cases	PAF (%)	Relative risk	Observed cases	Excess attributable cases	PAF (%)
0–4	1	2	0	—	1	2	0	—
5–9	1	0	0	—	1	4	2	—
10–14	1	0	0	—	1	6	3	—
15–19	1.0005	4	0	0.1	1.0026	23	0	0.3
20–24	1.0044	32	0	0.4	1.0234	57	1	2.3
25–29	1.0114	167	2	1.1	1.0646	90	5	6.1
30–34	1.0194	548	10	1.9	1.1171	103	11	10.5
35–39	1.0258	1265	32	2.5	1.1639	160	23	14.1
40–44	1.0291	2593	73	2.8	1.1885	278	44	15.9
45–49	1.0298	4236	123	2.9	1.1950	428	70	16.3
50–54	1.0303	4810	141	2.9	1.1999	498	83	16.7
55–59	1.0306	5582	166	3.0	1.2026	623	105	16.8
60–64	1.0329	6459	206	3.2	1.2232	883	161	18.2
65–69	1.0353	6403	219	3.4	1.2448	852	168	19.7
70–74	1.0363	4332	152	3.5	1.2538	828	168	20.2
75–79	1.0355	4058	139	3.4	1.2463	734	145	19.8
80–84	1.0318	3526	109	3.1	1.2134	616	108	17.6
⩾85	1.0299	4367	127	2.9	1.1973	635	105	16.5
All ages		48 385	1498	3.1		6820	1201	17.6

Abbreviation: PAF = population-attributable fraction.

represents 1.7% of cancers in women and 0.9% of all cancer cases in 2010.

DISCUSSION

Though it may be desirable, from the point of view of cancer prevention, to have multiple pregnancies commencing at a young age, there are equally, or more, persuasive reasons to avoid such a lifestyle. It makes no sense, therefore, to prescribe an ideal fertility pattern, against which the number of cancers attributable to a less optimum one can be evaluated. In the IARC calculation of avoidable cancers in France (IARC, 2007), the fertility pattern of 1980 was taken as an ideal against which the excess cases resulting from fertility in 2000 were calculated, although the rationale for this was not explained. The origin of the Doll and Peto (2003) estimate of 15% of UK cancer deaths being attributable to 'reproduction' (and other factors related to the secretion of reproductive hormones) is obscure; the methodology is said to be the same as in their 1981 monograph (Doll and Peto, 1981), although this considers some 46% of the deaths due to cancers of the breast, ovary and uterus (corpus and cervix) as attributable to reproductive and sexual factors, and these cancers are responsible for only 8% of cancer deaths in UK in 2005.

It is reasonable, however, to advocate breastfeeding for a variety of reasons, of which the benefit of cancer protection is one (http://www.breastfeeding.nhs.uk/en/fe/page.asp?n1 = 2). The 'optimum' levels for breastfeeding against which attributable fractions of breast and ovarian cancer have been evaluated are rather artificial, in that it would be impossible for *all* women to breastfeed their infant for 6 months. In the United States, for example, the US Department of Health and Human Services (2005) *Healthy People 2010* objectives for breastfeeding initiation and duration were to increase the proportion of mothers who exclusively breastfeed their infants through age 3 months to 60% and through age 6 months to 25%. Exclusive breastfeeding is defined as an infant receiving only breast milk and no other liquids or solids except for drops or syrups consisting of vitamins, minerals or medicines (WHO, 1991). Clearly, the target for partial breastfeeding may be more ambitious, so that the target may not be so very far from the theoretical optimum, advocated by WHO.

See acknowledgements on page Si.

Conflict of interest

The author declares no conflict of interest.

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