5 Breast cancer

5.1 Summary

Breast cancer accounts for 20% of all malignant neoplasms in women (table 5.1). If non-melanoma skin cancer is excluded, it is the most common cancer diagnosed in women in Ireland. Each year, approximately 1,820 women and 13 men are diagnosed with a malignant breast tumour. Incidence rates in women increased by 2.7% annually, between 1994 and 2003. Those in men changed little over time.

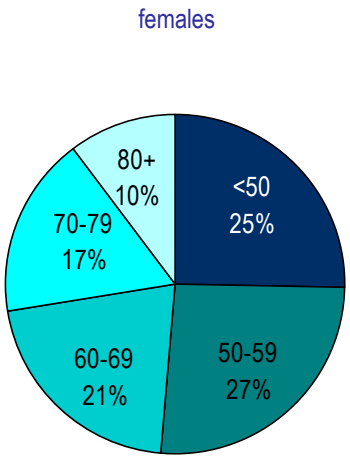
The remainder of this chapter relates only to breast cancer in women.

Table 5.1 Summary information for breast cancer in Ireland, 1994-2003

	females	males
% of all new cancer cases	20%	0.1%
% of all new cancer cases excluding non-melanoma skin cancer	28%	0.2%
Average number of new cases per year	1,820	13
Average number of deaths per year	640	5
Age standardised incidence rate per 100,000 (European standard population)	103.8	0.8
Estimated annual percentage change in rate 1994-2003	2.7%	-1.4%

The incidence of breast cancer, in common with most cancers, increases with increasing age (figure 5.1). Around 25% of cases present in those aged under 50, with a slightly larger percentage (27%) in those aged 50-59. 27% of cases occur in those aged over 70.

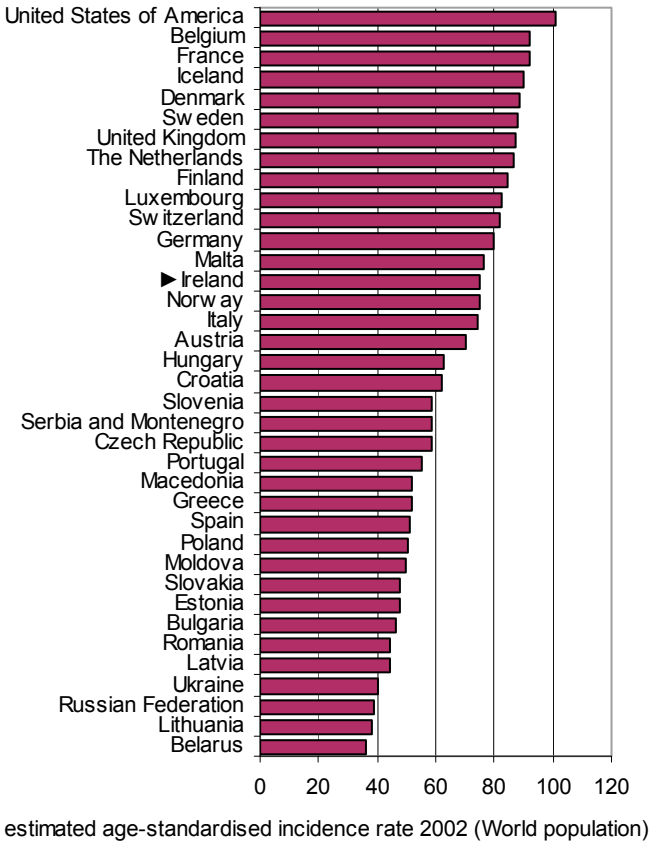
Figure 5.1 Age distribution of breast cancer cases, 1994-2003



5.2 International variations in incidence

Breast cancer incidence in women in Ireland is low compared to that in most other countries in western Europe although close to the average for Europe as a whole (figure 5.2). The rate in the USA exceeds rates in western Europe and Canada; this is likely to reflect differences in screening activity.

Figure 5.2 Estimated incidence rate per 100,000 in 2002 for Europe and USA: breast cancer females



Source: GLOBOCAN 2002 (Ferlay et al, 2004)

5.3 Risk factors

Table 5.2 Risk factors for breast cancer, by strength of evidence

	Increases risk	Decreases risk
Convincing or probable	Family history of breast cancer[1,2]	Breastfeeding[6,11]
	Nulliparity and low parity[2,3]	Physical activity[5,6]
	Late age at first pregnancy[2,3]	Greater body fat (pre-menopausal breast cancer)[5,6]
	Late natural menopause[2,3]	Tamoxifen and raloxifene[12,13,14]
	Early menarche[2,3]	
	Oral contraceptives[4,5]	
	Hormone replacement therapy[4,5]	
	Body fatness, abdominal fatness and weight gain in adulthood (post-menopausal breast cancer)[6,7]	
	Alcohol [7,8]	
	Ionizing radiation exposure (including X-rays and gamma radiation)[9]	
	High socio-economic status[10]	
Possible		Aspirin and other non-steroidal anti-inflammatory drugs[15]

[1] First degree relatives(s) with breast cancer; [2] Veronesi et al, 2005; 3 Key et al, 2001; [4] International Agency for Research on Cancer, 2007b; [5] combined oestrogen-progestogen formulations; [6] International Agency for Research on Cancer, 2002; [7] World Cancer Research Fund / American Institute for Cancer Research, 2007; [8] International Agency for Research on Cancer, in press; [9] US Department of Health and Human Services, 2005; [10] Faggiano et al, 1997; [11] Collaborative Group on Hormonal Factors in Breast Care, 2002; [12] in pre-menopausal women at high breast cancer risk; [13] Levine et al, 2001; [14] Wickerham et al, 2009; [15] Bosetti et al, 2006

A woman's chance of developing breast cancer is increased if any of her first degree female relatives had the disease; risk rises further if more than one relative has been affected, especially if this was at a young age (Veronsi et al, 2005). This points to the importance of genetic factors in breast cancer. Up to 10% of cases are hereditary and women who have mutations in the *BRCA1* or *BRCA2* genes have a very high chance of developing breast cancer over their lifetime (Antoniou and Easton, 2006). Recent genome-wide association studies have identified several new candidate loci, some of which appear to be associated with particular subtypes of breast cancer, but considerable further work will be needed to establish the specific causal variants involved (Easton and Eeles, 2008).

Lifetime exposure to oestrogen is the major determinant of breast cancer risk (table 5.2). Early menarche (onset of menstrual periods), late natural menopause, not bearing children (or having few children), and late age at first pregnancy (>30) are all markers of increased endogenous oestrogen exposure and are associated with raised risk of the disease. Exposure to exogenous sources of oestrogen (i.e. using oral contraceptives or hormone replacement therapy (HRT)) also increases risk. On the other hand, in pre-menopausal women at high risk of

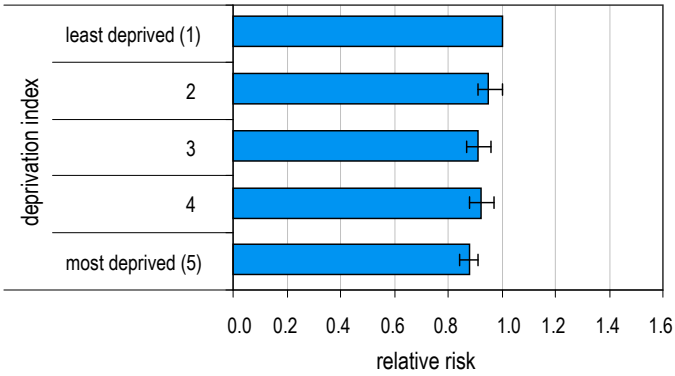
breast cancer, the anti-oestrogenic drugs tamoxifene and raloxifene reduce the chances of developing the disease by about half.

In terms of lifestyle factors, there is convincing evidence that body fatness and physical activity levels affect risk. Risk of post-menopausal breast cancer is increased in women with higher levels of body fatness, particularly those with fat stored around the abdomen, and in those who gain weight during adult life. In contrast, greater body fatness is associated with decreased risk of pre-menopausal breast cancer. Higher levels of physical activity are related to decreased risk of both pre- and post-menopausal disease. Alcohol is a clearly established cause of both pre-menopausal and post-menopausal breast cancer.

Women with a higher socio-economic status have consistently been found to be at increased risk of breast cancer. It is likely that this represents socio-economic variation in risk factors for the disease.

5.4 Electoral district characteristics and cancer incidence

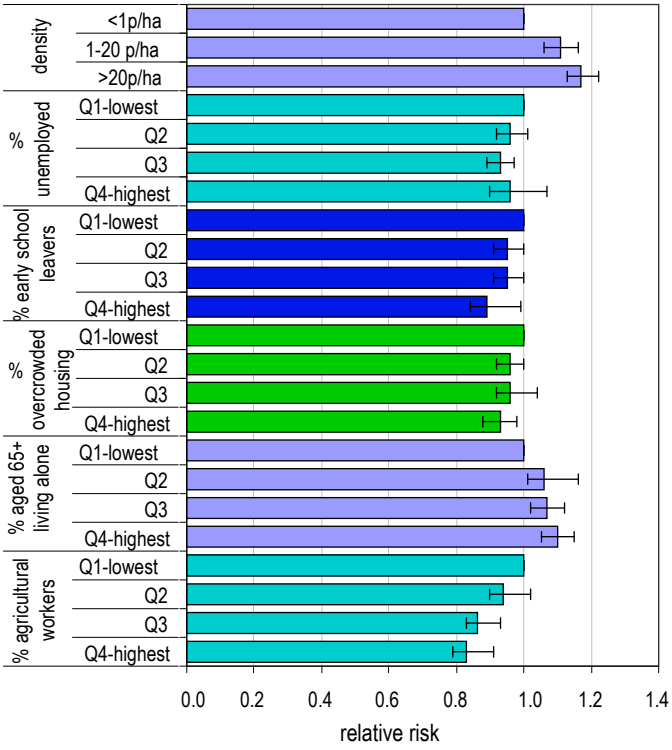
Figure 5.3 Adjusted relative risks of breast cancer by deprivation index: females



Adjusted for population density

The incidence of female breast cancer decreased with increasing deprivation (figure 5.3). The most deprived areas were associated with a 12% lower risk than the least deprived areas (RR=0.88, 95% CI 0.84-0.91).

Figure 5.4 Adjusted relative risks of breast cancer by area characteristics: females



All variables mutually adjusted except % of agricultural workers (not adjusted for density)

Breast cancer risk was positively associated with population density: women resident in urban areas (density >20p/ha) had a 17% higher risk than women living in the lowest density areas (figure 5.4).

Areas with the highest proportion of early school leavers, and those with the highest proportion of agricultural workers, were associated with a reduced risk of breast cancer. Areas with higher levels of unemployment also had a slightly lower risk, but the association was weak.

The risk of breast cancer was significantly increased in areas with a high proportion of people aged 65 and older living alone.

Socio-economic variation

The observed inverse association between breast cancer and deprivation is consistent with many other studies. The higher incidence in urban areas (which was seen after adjustment for socio-economic factors) is more surprising. However, population-based breast screening was available in the largest urban area, Dublin, from 2000 onwards and is likely to have affected the incidence figures. Women from urban areas also have easier access to

mammography, for both screening (outwith the programme) and symptomatic diagnosis. The association between breast cancer and higher proportions of people over 65 living alone is intriguing and more difficult to explain.

5.5 Mapping and geographical variation

Geographical variation

The geographical variation in breast cancer incidence was relatively modest. The areas of highest incidence were around the major urban areas - Dublin (especially), Cork, Galway, Waterford, and Sligo, but not Limerick (map 5.1). Outside these areas, there was a slightly increased incidence in west Cork, north Kerry, and a large area in the east Midlands. Within the two major urban areas, the incidence in southeast Dublin was clearly higher than that in the north and west, while in Cork the geographical pattern was less pronounced, but there was a suggestion of higher incidence in the southern suburbs.

Breast cancer incidence is strongly confounded by the presence and coverage of screening activity, which will tend to increase incidence, particularly during the initial phase. Organised screening began in Ireland in the eastern part of the country in 2000, and this may account for the higher incidence around Dublin and in the east Midlands. Screening outside the organised national programme may be responsible for much of the other excess of cases around the urban areas. Other than the relationship with urban areas and screening, the geographical pattern of breast cancer incidence showed no clear similarities with the distribution of known risk factors such as obesity, alcohol or social class (as measured by income; Appendix 1). There were some similarities with the distribution of levels of private health insurance (Appendix 1).

Map 5.1 Breast cancer, smoothed relative risks: females