1
Cancer epidemiology

1.1 Cancer incidence, prevalence and mortality

Every year, more than 285 000 people are diagnosed with cancer in the United Kingdom, and the current estimate is that more than one in three people will develop a form of cancer at some point in their lifetime. There are more than 200 different types of cancer, but four particular tumour types: breast, lung, colorectal and prostate- constitute over half of all new cases diagnosed (Figure 1.1). Cancer incidence, defined as the number of new cases arising in a period of time, is gender and age specific. In males, prostate cancer is the most prolific, where almost 35 000 new cases were diagnosed in 2004, followed by lung cancer, with around 22 000, and bowel cancer, with around 20 000 new cases per year. However, in females, breast cancer continues to be the most common tumour type, the disease accounting for nearly one in three female cancers, with over 44 000 new cases diagnosed in the year 2004. Cancer incidence may be further defined by the lifetime risk of developing the disease. For instance, in females, the risk of developing breast cancer is 1 in 9, and in males, the risk of developing prostate cancer is 1 in 14. In some tumour types, there are considerable gender-related differences in cancer risk; for example, males are nearly twice as likely to develop lung cancer (1 in 13) than women (1 in 23). Cancer occurs mostly in older people, and the risk of developing cancer increases with age. For example, in the 25–34 age group, the rate of diagnosis in males is 1834 cases per 100 000 of the population, and in females, 2782 cases per 100 000. However, in the 75 + age group, the rate of diagnosis in males has risen sharply to 52 831 cases per 100 000 in males and 50 803 cases per 100 000 in females. Overall, in the 10 year period 1995–2004, cancer incidence rate has been relatively constant, with a slight increase of around 1% in males and a slight increase in females of 3%. Broken down by cancer type, the largest increases in incidence rate within this period have been seen in malignant melanoma (43%), uterine (21%), oral (23%) and kidney cancer (14%). Cancer is currently the cause of a quarter of United Kingdom deaths, and around two thirds of all deaths in adults under 65 years. In fact, cancer caused 27% of all deaths in the United Kingdom in 2006; that is 29% in males and 25% in females. Five particular tumour types: lung, colorectal, breast, prostate and oesophagus, are responsible for over half (52%) of all cancer mortality (Figure 1.2). Survival is usually defined as the

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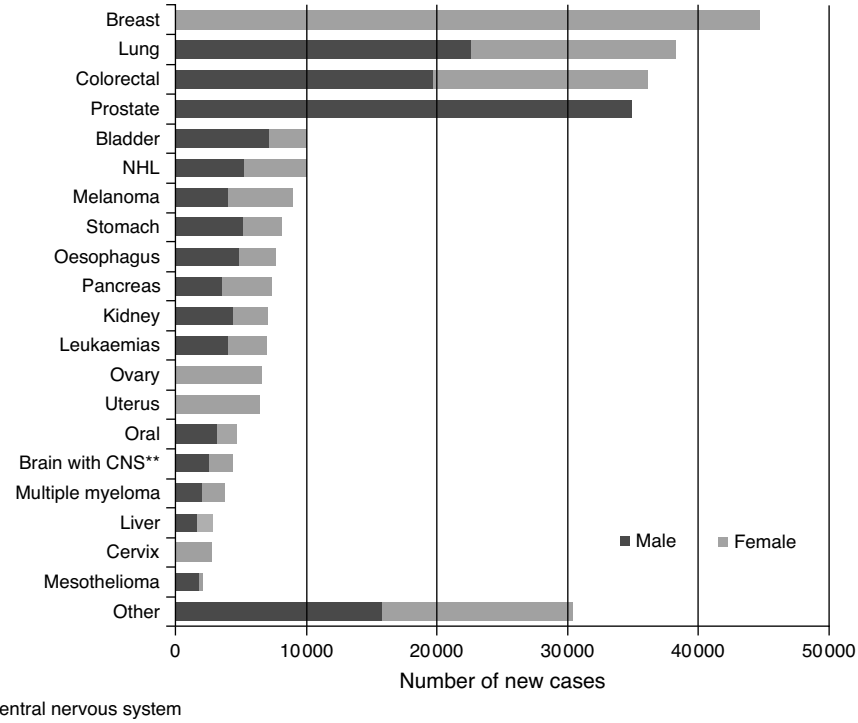

Figure 1.1 The 20 most commonly diagnosed cancers diagnosed in the United Kingdom, 2004. NHL, non-Hodgkin lymphoma. Reproduced with permission from Cancer Research UK http://info.cancerresearchuk.org/cancerstats August 2008.

percentage of patients diagnosed with cancer still alive after a 5 year period. Survival rates vary according to cancer type (Figure 1.3), where cancers may be grouped into three survival bands: 50% or higher, which includes testicular (95%), female breast (77%) and cervix (61%) cancers; 10–50% survival, including colon (47% in males, 48% in females), renal (45% in males, 48% in females) and brain (12% in males, 15% in females); and cancers where less than 10% of all patients are alive after 5 years, notably oesophageal cancer (7% in men, 8% in women), lung (6% in men, 6% in women) and pancreatic (2% in men, 2% in women) cancers. In general, women have higher survival rates than men (43% in men compared to 56% in women), and among adults, survival decreases with increasing age (Table 1.1). This may be due, in part, to mortality that is non-specific to the disease. However, other factors may be contributory, such as the smaller proportion of elderly patients entered into phase I clinical trials. Exceptions to this trend usually occur where the age of the patient at diagnosis is a reflection of the molecular and pathological characteristics of the tumour, for example, breast tumours in premenopausal women tend to be more aggressive, therefore survival rates in these age groups are decreased relative to postmenopausal women.

Progress in the early diagnosis and treatment of cancer has positively affected cancer survival rates. In the United Kingdom, female breast cancer mortality rate has fallen

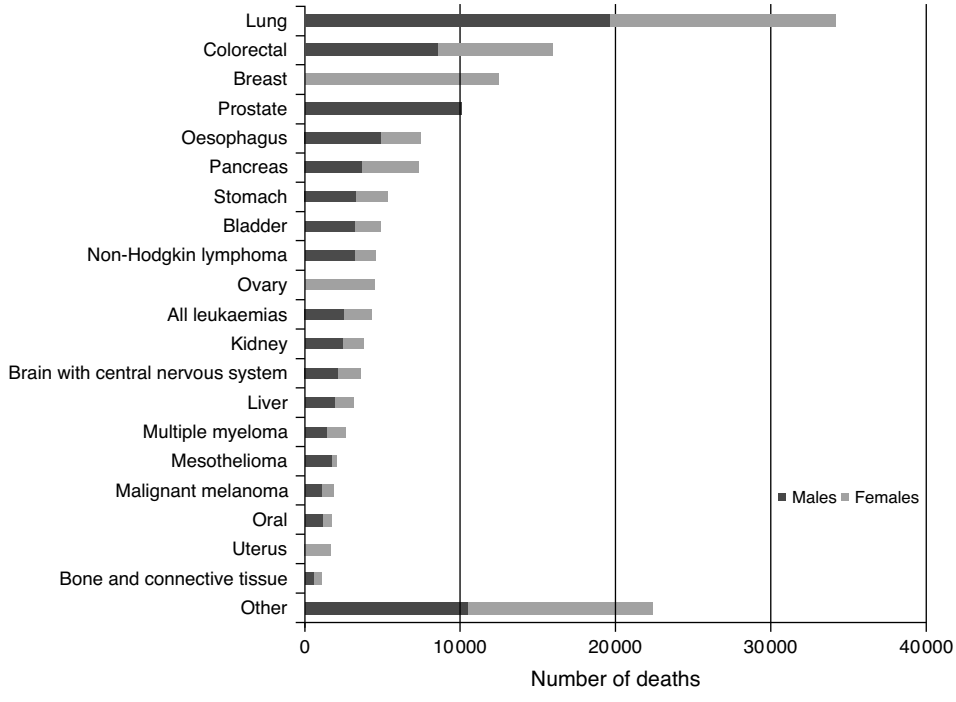

Figure 1.2 The 20 most common causes of death from cancer, persons, United Kingdom, 2006. Reproduced with permission from Cancer Research UK http://info.cancerresearchuk.org/cancerstats August 2008.

sharply, from 15 625 deaths from the disease in 1989 compared with 12 319 deaths in 2006. It is estimated that the National Health Service mammography breast screening programme saves around 1400 lives annually, detecting around 14 000 new cases of breast cancer per year. In prostate cancer, where tests for the biomarker prostate-specific antigen (PSA) have increased the proportion of PSA-detected asymptomatic prostate tumours diagnosed, and because these have an inherently good prognosis, the recorded survival rate has also increased dramatically. This is reflected by the change in 5-year survival rates over the period 1986–1999 (Figure 1.4), where the survival rate for breast cancer increased by an average of 5.4%, and for prostate cancer, by an average of 11.4% every 5 years.

1.2 Childhood cancers

By the age of 15 years, 1 in 500 children will be affected by childhood cancer, which in the United Kingdom means that around 1500 children are diagnosed with cancer every year. Childhood cancer is still relatively infrequent – the most common form being acute lymphoblastic leukaemia, though some rarer cancers are of embryological origin, such as retinoblastoma, rhabdomyosarcoma and neuroblastoma. Together, these were

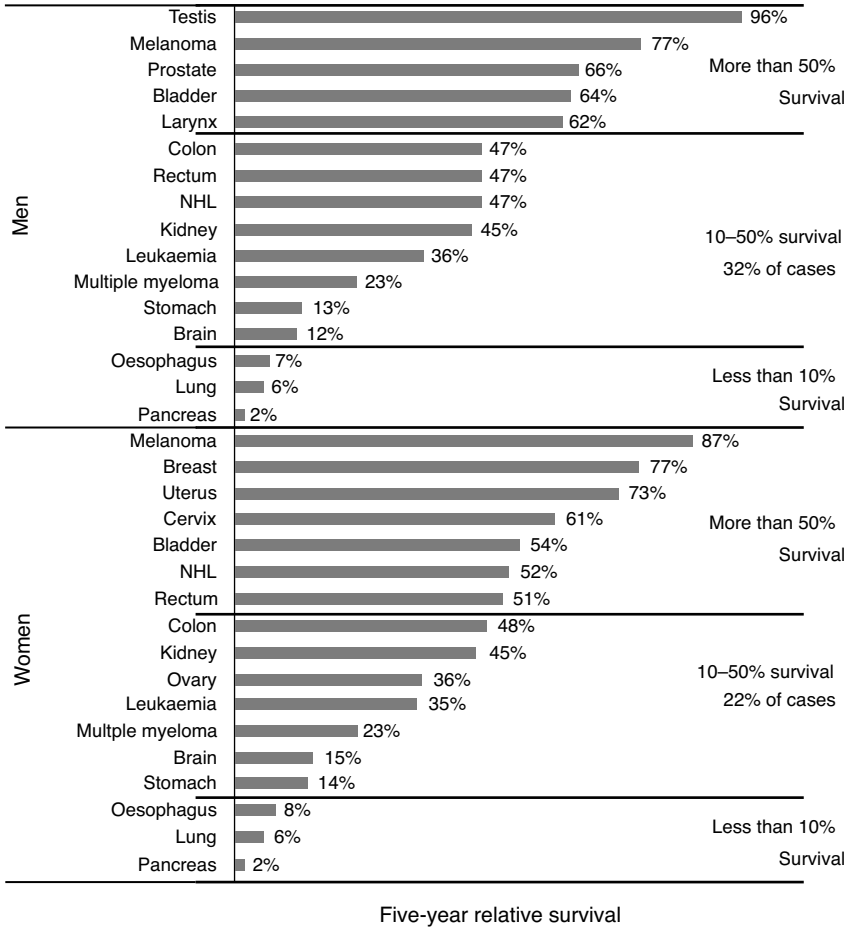

Figure 1.3 Five-year age-standardized relative survival (%) adults diagnosed 1996–1999, England and Wales by sex and site. NHL, non-Hodgkin's lymphoma. Reproduced with permission from Cancer Research UK http://info.cancerresearchuk.org/cancerstats August 2008.

responsible for 1.8% of deaths in children under 15 in the United Kingdom in the time period 2000–2002 (Table 1.2), with an average total of 301 deaths per year (Table 1.3). Figure 1.5 shows mortality rate broken down by cancer type in Great Britain in the time period 1997–2001, where 32% of deaths were caused by leukaemias compared to 1% by retinoblastoma. In all cancer types, survival rates have risen dramatically, where between 1962 and 2001 death rates decreased by an average of 2.6% per year, amounting to a fall of more than half. There has been a steady increase in survival rates in all childhood cancer types, where almost 72% of the cases diagnosed in the time period 1992–1996 have survived for longer than 5 years. This is attributable to the continual refinement and validation of combination chemotherapy regimens made possible by the steady enrolment of children into phase III clinical trials, as well as improved diagnostic techniques. The best example of the sort of improvements in survival rates

Table 1.1 Five-year survival by site and age at diagnosis for patients diagnosed in England and Wales 1996–1999, follow up to 2001

Cancer type	Sex	Age at diagnosis (%)					
		15–39	40–49	50–59	60–69	70–79	80–99
Bladder	Men	90	84	77	70	62	48
	Women	78	70	75	65	53	40
Breast	Women	76	82	85	82	74	58
Cervix	Women	83	73	60	48	36	22
Colon	Men	61	54	50	50	47	40
	Women	58	54	54	52	48	39
Lung	Men	21	9	9	7	5	2
	Women	28	13	11	8	4	1
Ovary	Women	81	55	44	32	23	15
Prostate	Men	76	58	75	77	68	48
Rectum	Men	54	55	54	52	47	34
	Women	60	61	62	58	49	36
Stomach	Men	18	17	15	16	12	7
	Women	19	22	20	19	14	8
Testis	Men	97	96	95	86	67	55
Uterus	Women	77	81	85	78	67	45

Adapted from Cancer Research UK statistics available at http://info.cancerresearchuk.org/cancerstats/survival/age/?a=5441. Accessed 9 October 2008.

Table 1.2 Main causes of child mortality, ages 1–14, by sex and age group, in England and Wales 2000–2002

	Percentages			
	Males		Females	
	1–4 years	5–14 years	1–4 years	5–14 years
Infections	11	3	7	5
Cancers	14	23	13	24
Nervous system and sense organs	14	15	12	14
Circulatory system	4	5	7	6
Respiratory system	9	5	8	8
Congenital anomalies	14	7	15	9
Accident	17	30	16	19
Other	17	12	20	16
All deaths (= 100%) (numbers)	968	1444	752	1049

Taken from Cancer Research UK statistics available at http://info.cancerresearchuk.org/cancerstats/childhoodcancer/mortality/?a=5441. Accessed 9 October 2008.

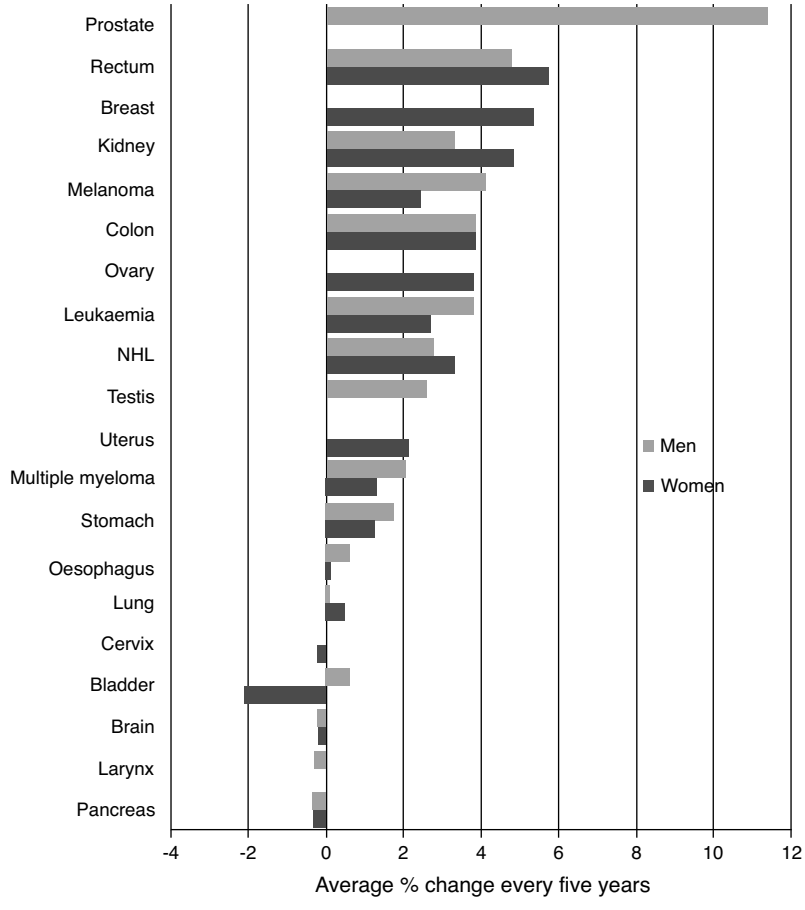

Figure 1.4 Average change (%) every 5 years in 5-year relative survival, by site and sex, adults diagnosed in England and Wales in time period 1986–1999. NHL, non-Hodgkin lymphomas. Reproduced with permission from Cancer Research UK http://info.cancerresearchuk.org/cancerstats August 2008.

achieved is in acute lymphoblastic leukaemia (shown in Figure 1.6 alongside other cancer types), where 5 year survival rate has risen from 12% of cases diagnosed in the time period 1962–1971 to 80% of those diagnosed in the time period 1992–1996.

1.3 Global epidemiology

Global cancer incidence rate (per 100 000 population) for all cancers, as compared with the number of cancer deaths is shown in Figure 1.7, where crude rate is calculated by dividing the number of new cancers diagnosed during a given time period by the number of people in the population at risk. The number of cancer deaths is highest in the United States, which is partially due to large population. However, from the crude incidence rates, it is easily apparent that the population of China, which is significantly

Table 1.3 Annual average number of deaths from cancer before age 15, United Kingdom, 2000–2002 (average rounded to nearest whole number)

Country	Males	Females	Total
England and Wales	148	119	267
Scotland	16	9	25
N Ireland	8	2	9
UK	172	129	301

Taken from Cancer Research UK statistics available at http://info.cancerresearchuk.org/cancerstats/childhoodcancer/mortality/?a=5441. Accessed 9 October 2008.

larger than that of the United States, is considerably less affected by cancer, particularly in women. Incidence rates are broken down by gender, cancer type (lung, bladder, leukaemia, melanoma) and country (United Kingdom, United States, Australia, China, France, Germany and the Netherlands) in Figures 1.8–1.11. These may be explained by differences in lifestyle factors. These include diet, where the chemopreventive properties of soy beans in the Chinese diet, particularly with reference to bladder cancer, have been documented and are reflected in Figure 1.9; and the environment, where there is a notably higher rate of melanoma incidence in Australia due to the risks of sun exposure (Figure 1.11).

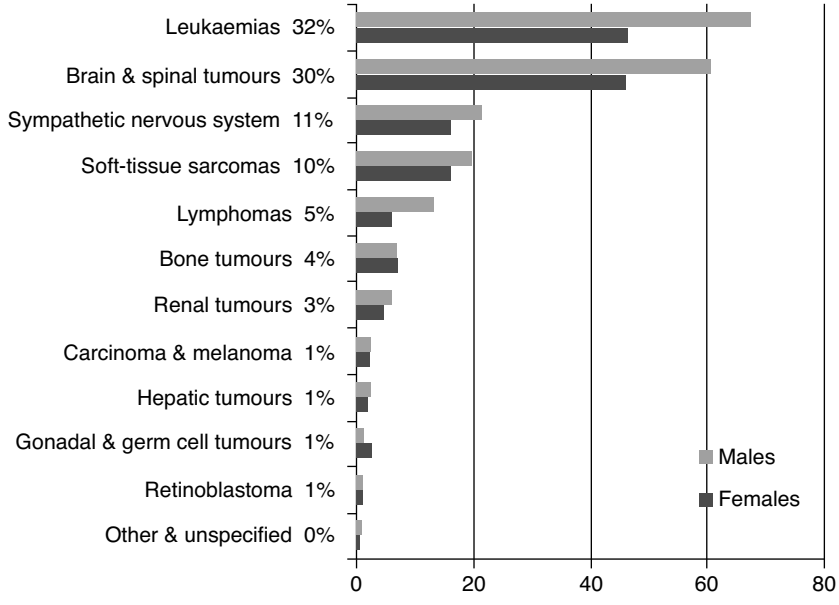

Figure 1.5 Annual average number of deaths in children aged under 15 years previously diagnosed with cancer, by diagnostic group and sex, Great Britain 1997–2001. Reproduced with permission from Cancer Research UK http://info.cancerresearchuk.org/cancerstats August 2008.

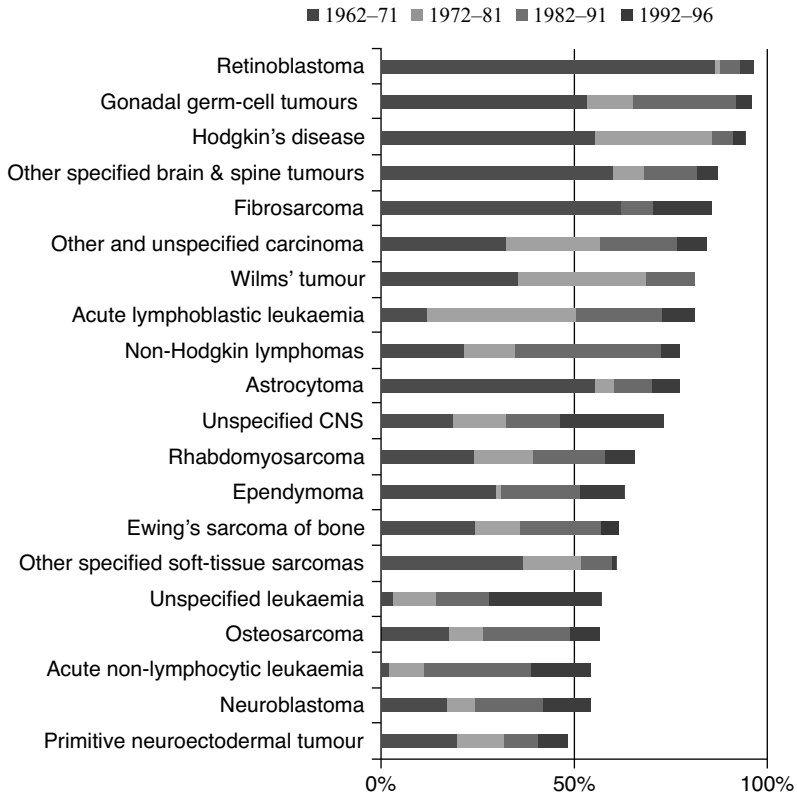

Figure 1.6 Survival of childhood cancer patients diagnosed in successive periods, Great Britain, 1962–1996. Reproduced with permission from Cancer Research UK http://info.cancerresearchuk.org/cancerstats August 2008.

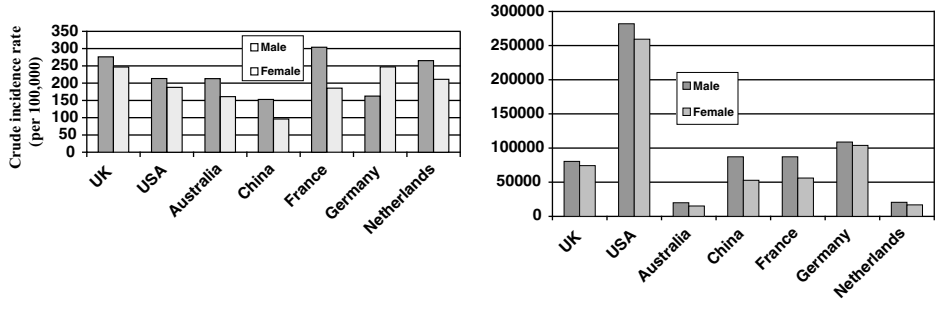

Figure 1.7 World cancer incidence, showing crude incidence rate (left) and number of deaths for all cancers (right) in 1998. Compiled using data from CANCERMondial http://www-dep.iarc.fr. Accessed October 2002.

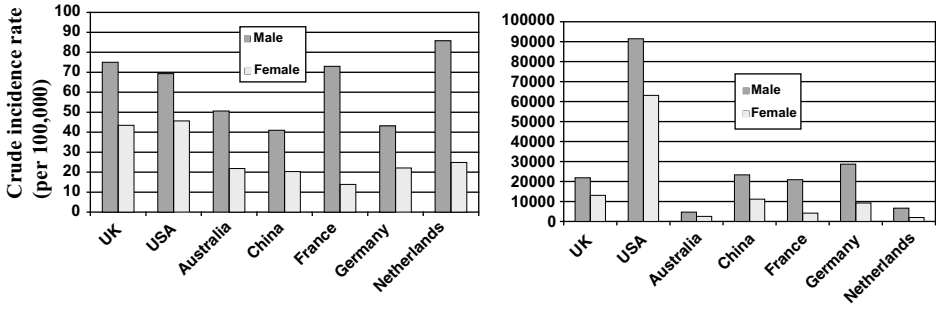

Figure 1.8 World cancer incidence, showing crude incidence rate (left) and number of deaths (right) for lung cancer in 1998. Compiled using data from CANCERMondial http://www-dep.iarc.fr. Accessed October 2002.

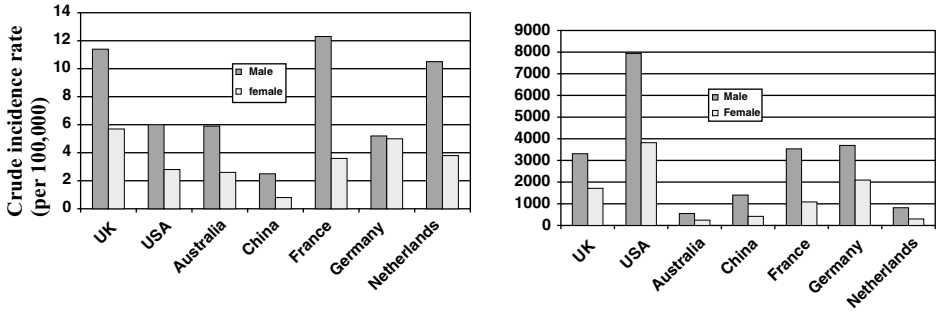

Figure 1.9 World cancer incidence, showing crude incidence rate (left) and number of deaths (right) for bladder cancer in 1998. Compiled using data from CANCERMondial http://www-dep.iarc.fr. Accessed October 2002.

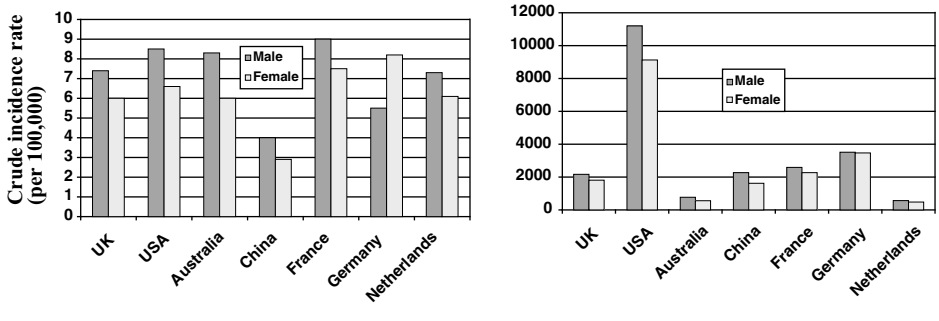

Figure 1.10 World cancer incidence, showing crude incidence rate (left) and number of deaths (right) for leukaemia in 1998. Compiled using data from CANCERMondial http://www-dep.iarc.fr. Accessed October 2002.

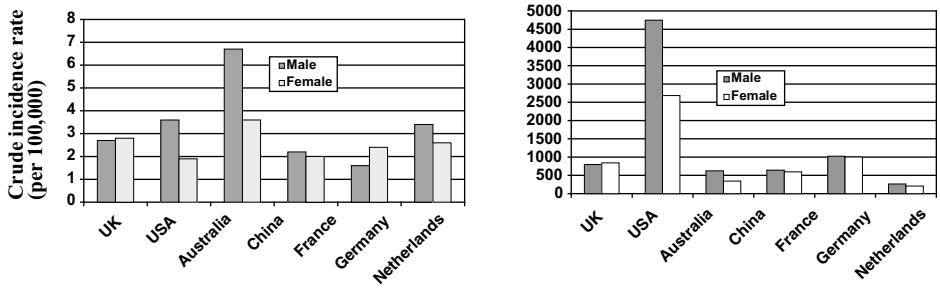

Figure 1.11 World cancer incidence, showing crude incidence rate (left) and number of deaths (right) for melanoma in 1998. Compiled using data from CANCERMondial http://www-dep.iarc.fr. Accessed October 2002.