Social Inequalities and Cancer
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Social inequalities and cancer

A summary by the Editors

Why study socioeconomic factors and cancers?

Inequalities in health reflect social inequalities in society; they provide perhaps the most convincing index of inequality (Chapter 2). Despite attempts to change the social structure and to arrive at a more egalitarian society, social inequalities have not disappeared and seem even to be increasing worldwide. At the global level, socioeconomic differences in health are stark. They are apparent in the worse sanitary conditions, higher mortality, lower life expectancy and lower cancer survival rates of the populations of developing countries compared with those of industrialized countries. Differences in cancer risk are also seen within industrialized countries between the socioeconomically less and more favoured population groups. In certain areas of industrialized countries, social and environmental conditions comparable with those existing in the poorest countries of the world have been recreated. However, social inequalities in health are not limited to those of lowest socioeconomic status but operate across the whole of society.

The occurrence of cancer within a population can be studied at many different levels, including forms of social entities, 'the individual', a particular organ system, or a particular molecule (Chapter 1). The causes of cancer can also be studied at these different levels, including socioeconomic factors, lifestyle, and genetic alterations in a clone of cells. Clearly, there are advantages in understanding disease causation at all of the different levels at which it can be analysed. Although cancer risk factors such as tobacco smoke may appear to operate mainly at the individual level, exposure may occur due to a wide range of political, economic and social factors; conversely, tobacco smoke ultimately has effects at the cellular and molecular levels, including the production of mutations in crucial genes. Of course, it is important to gain information, and take action, at all possible levels, but the history of public health shows that changes at the population level are usually more fundamental and effective than changes at the individual level, even when a single risk factor accounts for most cases of disease. In this sense, a risk factor such as smoking can be regarded as a secondary symptom of deeper underlying features of the social and economic structure of society. Thus, just as a variety of health effects in various organ systems (for example, various types of cancer) may have a common contributing cause (for example, tobacco smoking) at the level of the individual, a variety of individual exposures (for example, smoking and diet) may have common socioeconomic causes at the population level.

This volume

This volume is organized in four parts and 20 chapters. The first part, 'General considerations', contains four chapters presenting an overview of issues of poverty and health, and also discussing theoretical and methodological issues on the definition and measurement of social class in epidemiological studies. (Regional, gender or ethnic differences in health, important in their own right, are beyond the scope of this book.) The second part, 'Evidence of social inequalities in cancer', includes two chapters summarizing international data on social class differences in cancer incidence and mortality, and in cancer survival. The third part, 'Explanations for social inequalities in cancer', contains 12 chapters. It starts with a discussion of general explanations for social inequalities and cancer, and then international data on the prevalence of major cancer risk factors in different social strata are presented, particularly for tobacco, alcohol, diet, reproductive patterns, sexual behaviour, infectious agents, environmental and occupational exposures, and the effects of unemployment. The extent to which these risk factors explain socioeconomic differences in cancer incidence is discussed. The fourth part comprises two chapters on socioeconomic differences in health care, which present and discuss differences in access to and use of health services, particularly in relation to the early diagnosis of cancer.

Theories of social class and measurement of social inequality (Chapters 3 and 4)

Concepts of class theory developed with the emergence of industrial society in the nineteenth century (Chapter 3). For an understanding of current divisions, however, theories must reflect the advances of capitalism and the global economy that characterize the late-twentieth century. In industrialized societies, reductions in the industrial workforce and the growth of finance, investment and real-estate industries worldwide have added a new service workforce that is largely female. Large sectors of industry have departed in search of cheaper labour in poorer countries. As a result, in those areas too, a new industrial workforce has emerged. Concomitantly, accumulation of land used for cultivation for the world market in less developed agricultural regions has led to an increase in mobile agricultural labour and a shift of landless labourers to the cities of less developed countries. In addition, both upward and downward mobility have occurred for individuals and groups in specific populations as well as for particular diseases in developed and less developed countries. All these changes have precipitated fundamental changes in class, gender and family relationships and transformed the living conditions of populations in both developed and less developed societies. These changes have major implications for the patterns of health and disease in the world today.

The measurement of socioeconomic status requires that we think more precisely about both conceptual issues and issues more traditionally thought of as measurement issues (Chapter 4). Progress in this area rests on our ability to identify those aspects of socioeconomic status that are most closely related to health, human development, and life expectancy. Measures of socioeconomic status have been based on characteristics of the individual as well as on characteristics of the environment or more ecologically based measures. Each of these types of socioeconomic status measures has strengths and weaknesses and in all likelihood taps somewhat different aspects of class. In measuring socioeconomic status across diverse populations, it is also crucial to be sensitive to the ways in which measurement varies across different cultures, ethnic and demographic groups. It is likely that more refined research in this area will clarify more fully why socioeconomic status is so profoundly related to health status. In order to understand this relationship, efforts will have to be focused on identifying not only those psychosocial or biological processes that occur 'downstream' as a result of socioeconomic status (for example, occupational exposures as a mediator of the higher cancer risk of manual social classes) but also the nature of the social experience itself and those 'upstream' forces that place so many individuals at risk (for example, the reasons why at this time manual social classes take up smoking more frequently than non-manual classes, although the cigarette smoking habit originated in the high classes).

Socioeconomic differences in cancer incidence and mortality (Chapter 5)

Data on the presence, magnitude and consistency of socioeconomic differentials in mortality and incidence of all malignant neoplasms and 24 individual types of neoplasms in 35 populations from 20 countries are reviewed in Chapter 5. Reasonably consistent excess risks in men in lower social strata were observed for all respiratory cancers (nose, larynx and lung) and cancers of the oral cavity and pharynx, oesophagus, stomach, and, with a number of exceptions, liver, as well as for all malignancies taken together. For women, low-class excesses were consistently encountered for cancers of the oesophagus, stomach, cervix uteri and, less consistently, liver. Men in higher social strata displayed excesses of colon and brain cancers and skin melanoma. In the two Latin American populations for which data were available, lung cancer was more frequent in higher social strata. Excesses in high socioeconomic strata were seen in women in most populations for cancers of the colon, breast, ovary, and skin melanoma. Data for the United Kingdom, Denmark, Italy and New Zealand are shown in Figure 1 for men and Figure 2 for women. Longitudinal data from England and Wales suggest widening over time of social class differences in men for all cancers combined (Figure 3) and for cancers of the lung, larynx and stomach, and in women for all cancers combined and for cervical cancer.

Socioeconomic differences in cancer survival (Chapter 6)

In the discussion of social inequalities in health there has been much debate on the role of medical

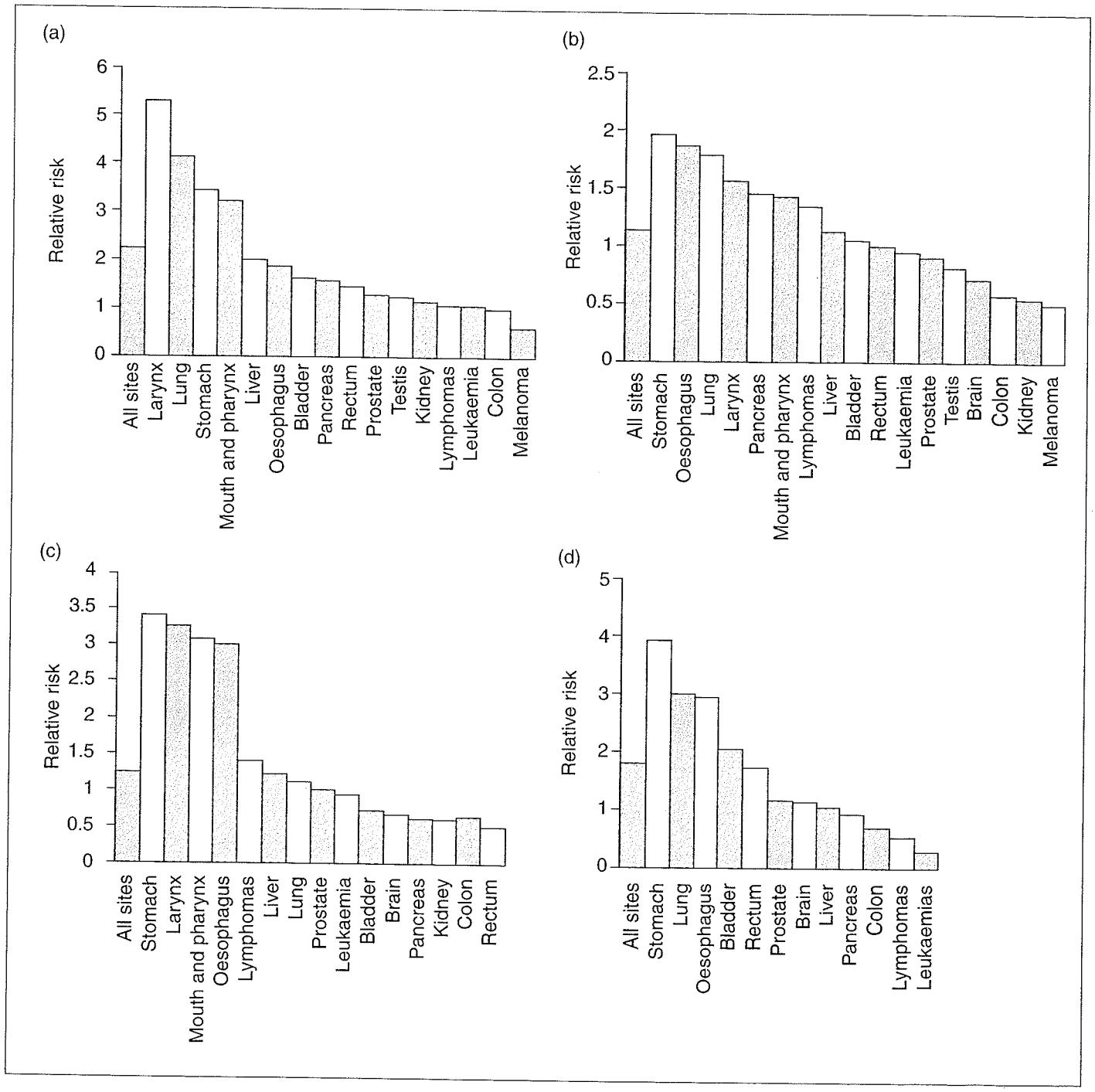

Figure 1. (a) Cancer mortality in men (aged 20–64) in social class V versus class I, in Great Britain during the years 1979–1980 and 1982–1983 (OPCS, 1986). (b) Cancer incidence in unskilled men versus employees group I (all ages), in Denmark during the years 1979–1980 (Lynge & Thygesen, 1990). (c) Cancer mortality in illiterate men versus men with university education (men aged 18–74), in Italy during the years 1981–1982 (Faggiano *et al.*, 1994). (d) Cancer mortality of men (aged 15–64) in social class V versus class I, in New Zealand during the years 1984–1987 (Pearce & Bethwaite, in press).

care. To understand the potential importance of socioeconomic differences in prompt detection and treatment of cancer, data on cancer survival are essential. These have been examined less extensively than differences in cancer incidence. Forty-two studies on social class differences in cancer survival, covering 12 cancer sites in 14 different countries, are reviewed in Chapter 6. Social class differences in cancer survival appear remarkably general (Figure 4). Patients in low social classes had consistently poorer survival than those in high social classes. The magnitude of the differences for most cancer

sites is fairly narrow, with most relative risks falling between a range of 1 and 1.5. The widest differences were observed for cancers of good prognosis and specifically cancers of the female breast, corpus uteri, bladder and colon. Social differences in cancer survival were present in both genders and in most countries and were found consistently whichever socioeconomic indicator was used.

General explanations for social inequalities in health (Chapter 7)

Life expectancy has always differed according to status in society, with a higher mortality among those of lower social status. Although cancer and cardiovascular diseases are proportionally more common as causes of death in rich societies, in industrialized countries the major causes of death

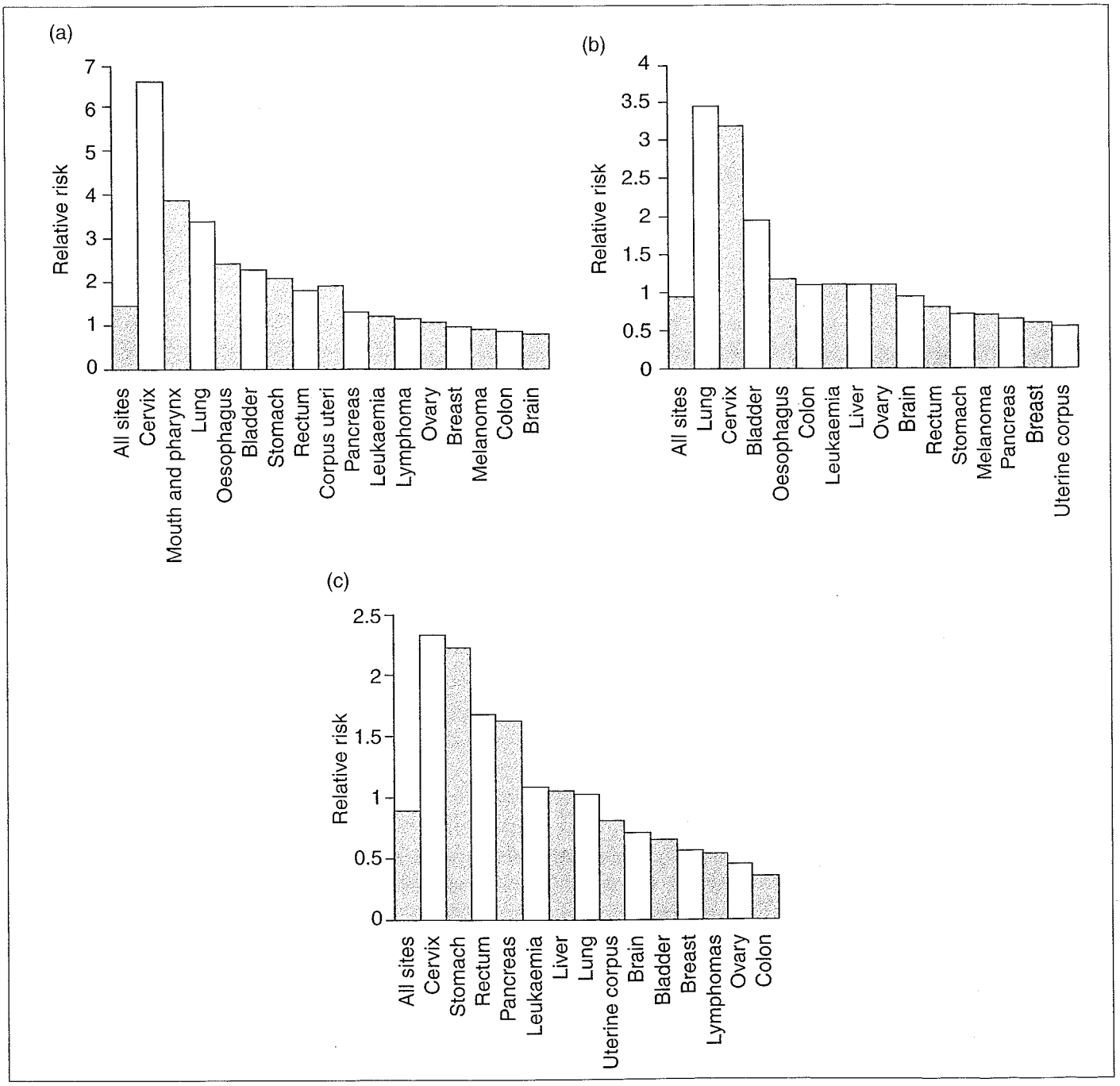

Figure 2. (a) Cancer mortality in women (aged 18–74) of social class V versus class I, in Great Britain during the years 1979–1980 and 1982–1983 (OPCS, 1986). (b) Cancer incidence in unskilled women versus employees group I (all ages), in Denmark during the years 1970–1980 (Lynge & Thygesen, 1990). (c) Cancer mortality in illiterate women versus women with university education (women aged 18–74), in Italy during the years 1981–1982 (Faggiano *et al.*, 1994).

are more common in those of lower social status. Much of the discussion about social inequalities in health has been focused on the health disadvantage of those of lowest socioeconomic status. Data from the Whitehall studies show that the social gradient in morbidity and mortality exists across employment grades in British civil servants, none of whom is poor by comparison with people in developing countries, suggesting that there are factors that operate across the whole of society. The magnitude of socioeconomic differences in health varies between societies, and over time within societies. This suggests that identification of factors that influence socioeconomic status and health, and the pathways by which they operate, is an important public health task that could lay the basis for a reduction in inequalities in health.

Tobacco smoking (Chapter 8)

Consumption of tobacco products is causally connected with many types of cancer – mainly lung, larynx, mouth and pharynx, oesophagus and bladder cancers. Tobacco is the main specific contributor to total mortality in many developed countries and has become a major contributor in developing countries as well. In most industrialized countries, prevalence of cigarette smoking is currently higher in low than in high social classes, the differences being more pronounced in men than in women. The pattern shown in Table 1 for Spain is characteristic of the pattern observed in industrialized countries in the last decades. This pattern of tobacco consumption may not be typical for developing countries. In some industrialized countries, smoking was more frequent in high social classes during the first half of this century. Trends in prevalence of smoking in the United States of America (Figure 5) and many other countries indicate that the proportion of current smokers has fallen more rapidly in high than in low social classes. To formulate and carry out effective tobacco control activities it is important to assess the relative incidence of tobacco-related cancers in different social strata and the prevalence of tobacco use across strata. Despite many years of data gathering, the information base is far from complete, especially in developing countries where tobacco use is increasing rapidly and where aggressive marketing by the transnational tobacco industry is occurring. A key question is the extent to which tobacco usage can 'explain' the observed social class differences in cancer risk. Class differences in lung cancer are likely to be mostly related to the unequal distribution of tobacco smoking between social classes, and in some fairly simple situations this has been satisfactorily demonstrated. Nevertheless, there are many unresolved issues, especially with regard to the role of collateral exposures, such as hazardous occupations, poor diet, and limited access to health care.

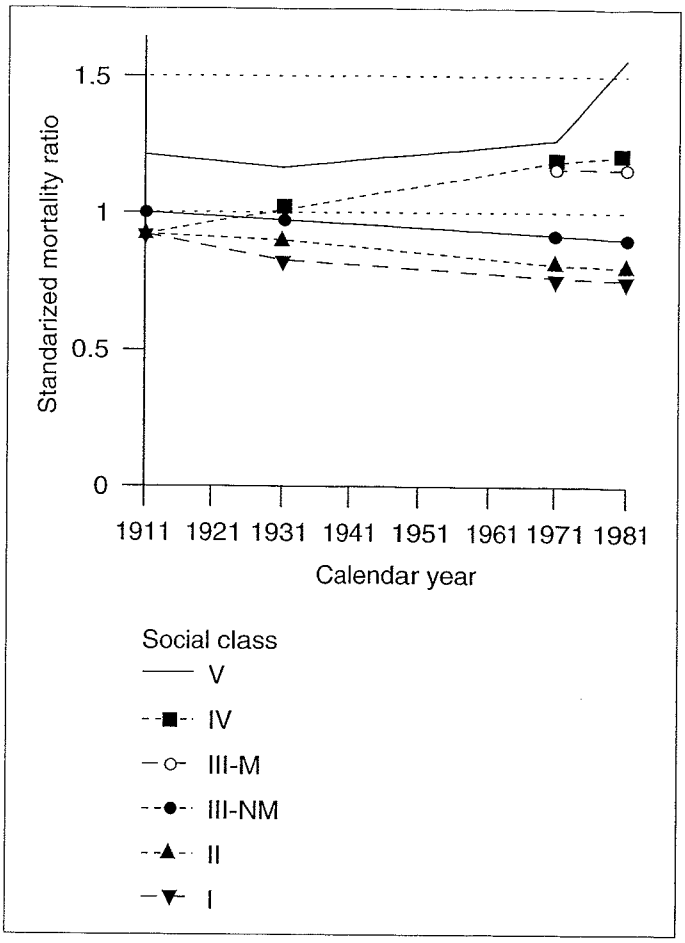

Figure 3. Time trends in mortality for men from all malignant neoplasms, by social class in England and Wales during the period 1911–1981. SMR, standardized mortality ratio.

Alcoholic-beverage drinking (Chapter 9)

Alcohol drinking causes cancers of the upper gastrointestinal and respiratory tracts and liver cancer. Patterns of alcohol drinking by socioeconomic status are not consistent between countries and between genders. A role of alcohol drinking in the observed negative social class gradients for alcohol-related cancers is very likely in men in France, Italy and New Zealand. Evidence that is less strong but suggestive of a role of alcohol drinking is seen for men in Brazil, Switzerland, the United Kingdom

and Denmark. Although a role of alcohol drinking in cancer causation is likely or possible in certain populations, other factors may contribute as well, most notably tobacco smoking and dietary habits.

Diet (Chapter 10)

There are a variety of ways in which diet may influence the development of human cancers. In Chapter 10, a theoretical framework is proposed in which a main feature is a dietary pattern to which humans are well adapted – an 'original diet'. This original dietary pattern had specific features, which included regular exposure to a variety of substances on which human metabolism is dependent but that are not usually explicitly labelled as 'essential nutrients'. The theory suggests that the higher risk of cancer in the low social classes at this time, in both the developed and developing world, is related, to an as yet unknown degree, to the fact that the amount of variation from the diet to which we are well adapted is greater in that portion of the population who have less access to the world's goods and services. This is particularly true regarding the intake of fresh vegetables and fruit, which are almost universally consumed in smaller quantities among the poor in most parts of the world. Some diet-related cancers, particularly breast cancer, run counter to the general trend towards higher risks in poorer people; it is probable that social class differences in other risk factors, particularly reproductive history, explain this discrepancy at least in part.

Reproductive factors (Chapter 11)

Socioeconomic variations in the risk of female reproductive cancers are marked. Data from the World Fertility Surveys, the Demographic and Health Surveys, and other national surveys are examined in Chapter 11 to assess whether these variations in cancer risk might be explained, at least in part, by socioeconomic variations in reproductive behaviour. Marked socioeconomic differentials in reproductive pattern were present in almost all settings: countries with low and high levels of modernization,

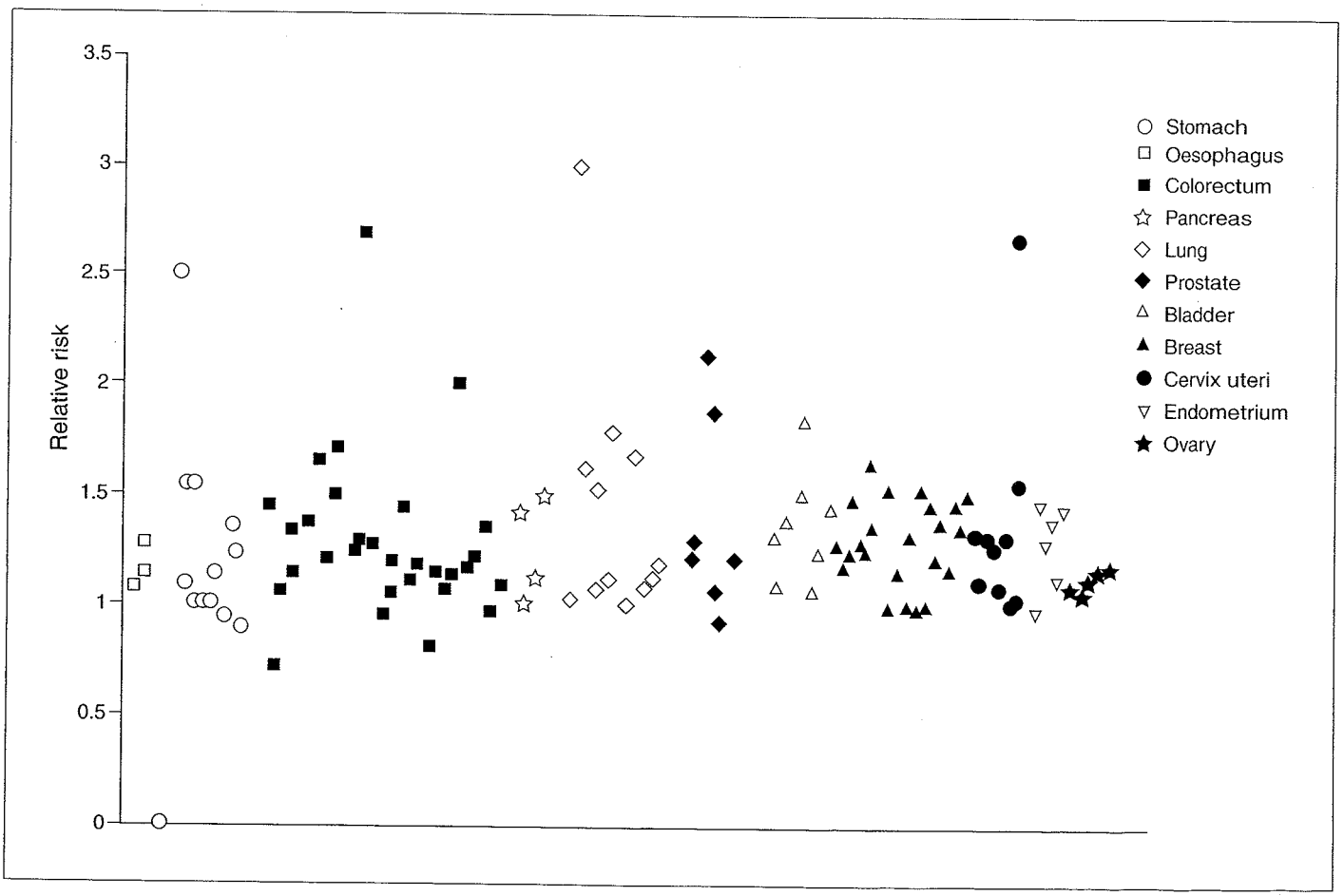

Figure 4. Socioeconomic differences in cancer survival: relative risks for patients in low versus high socioeconomic status in 33 studies.

Table 1. Prevalence of smoking (percentage) according to age and education in Spain, 1987

	Males		Females	
Education	**16–24 years**	**65+ years**	**16–24 years**	**65+ years**
Less than primary school	67%	34%	43%	1%
Primary school	62%	32%	46%	4%
High school	51%	39%	48%	6%
University	53%	37%	62%	5%

and countries with low and high levels of fertility (Table 2). In general, women of higher socioeconomic status and with more education had lower fertility and later age at first birth, a greater prevalence of childlessness, shorter duration of breast feeding and later age at menopause. The direction and size of these differences varied markedly from country to country according to level of economic development and, within each country, from generation to generation of women. In Western countries, some of these socioeconomic differences may possibly be narrowing in recent generations. There was little evidence of socioeconomic variations in age at menarche. The observed socioeconomic differentials in most aspects of reproductive behaviour account for some of the socioeconomic variation in risk of female reproductive cancers. However, this relationship could not be assessed directly because such analysis would require unavailable birth-cohort-specific data on socioeconomic variations in reproductive behaviour and in cancer risks.

Sexual behaviour and infection with human papillomavirus (Chapter 12)

Information on social class differences in sexual behaviour is available only for a limited number of, mostly industrialized, countries. According to population-based surveys in industrialized countries, men of low socioeconomic status report fewer sexual partners than men of high status. There is no clear indication that the same is true of women (Table 3). Cervical cancer is the most important cancer linked with sexual behaviour. It is the most common cancer in women in developing countries and the sixth most common in developed countries. In all areas, it is more frequent among women of low socioeconomic status, and is associated with multiple sexual partners and early age at first sexual intercourse. Both incidence and mortality are reduced by screening.

The human papillomavirus (HPV) has been shown to be the main biological agent causing cervical cancer. The extent to which infection with HPV and other sexually transmitted diseases relates to the occurrence of socioeconomic differences in cervical cancer incidence was examined in two parallel case–control studies in Spain and Colombia. The results, presented in Chapter 12, indicate that socioeconomic differences in the incidence of cervical cancer can, in part, be explained by differences in the prevalence of HPV DNA. Male sexual behaviour, and particularly contacts with prostitutes, may be a major contributor to the higher prevalence of HPV DNA among the poor.

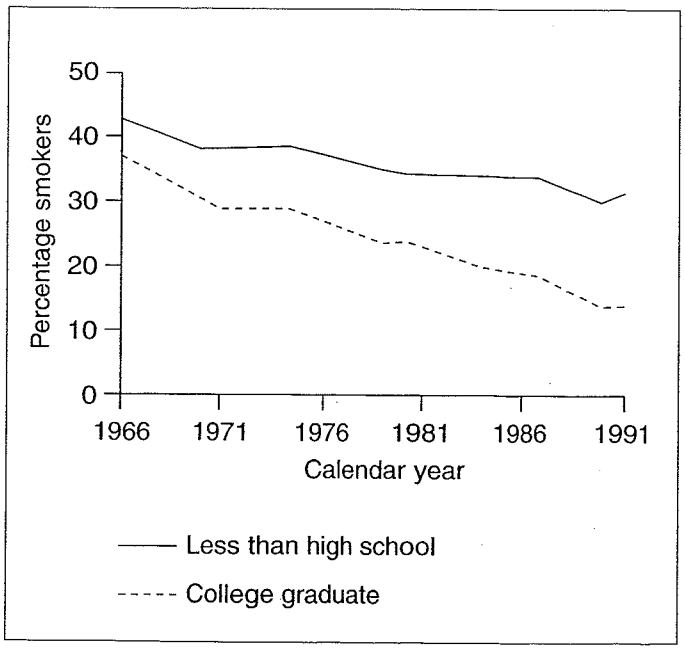

Figure 5. Time trends in the prevalence of smoking: percentage of current smokers in the USA by education.

Chronic infections (Chapters 13 and 14)

Various infectious agents, in addition to HPV, have been associated with the occurrence of cancer. Relations of such organisms to social class are available only for *Helicobacter pylori* and the hepatitis viruses (Table 4). The hepatitis B and C viruses (HBV and HCV) are major etiological factors in the occurrence of hepatocellular carcinoma worldwide, but most especially in developing countries where the majority of liver cancer cases can be found. *H. pylori* has been associated with stomach cancer.

In parallel with the geographic distribution of hepatocellular carcinoma, high levels of HBV endemicity also are concentrated in the developing world (Chapter 13). Low educational attainment, lower social stratum, and crowded urban residence have been reported to predict higher HBV chronic carrier prevalence in both developed and developing countries. More importantly, the effect of poverty on HBV endemicity is clearly evident among younger age groups, and earlier chronic HBV infection seems to increase the risk of development of hepatocellular carcinoma. The limited number of studies of the seroepidemiology of HCV also report an association between higher prevalence of antibodies to HCV and indicators of low social class. It would appear that the striking correlation between hepatocellular carcinoma and low socioeconomic status, both within industrialized societies and when comparing industrialized with less developed countries, is largely related to the impact of poverty on the spread of HBV and probably HCV.

Studies in the United Kingdom and USA strongly suggest that social class factors, in particular those acting during childhood, are determinants of infection with the bacterium *H. pylori* (Chapter 14). The odds ratio of seroprevalence are of the order of 1.5–5 for lower social classes compared with higher social classes. A conservative estimate of the role of social class, acting through an increased prevalence of *H. pylori* infection, on the burden of stomach cancer resulted in an estimated number of over 50 000 stomach cancer cases per year worldwide – or approximately 8% of all stomach cancers.

Table 2. Reproductive behaviour by socioeconomic status in developed and developing countries

	Developed countries		Developing countries	
	General tendency	Comments	General tendency	Comments
Parity	Higher in manual social classes	U-shaped relation in some countries	Higher in manual social classes	Differences more pronounced in Central and South America
Age at birth of first child	Earlier in manual social classes		Earlier in manual social classes	Less consistent data than in developed countries
Childlessness	No consistent pattern	Little data	No data	International data indicate a reduction of childlessness at the first phases of modernization, but this trend may reverse subsequently
Age at menarche	No data		Little variation	
Age at menopause	Earlier in manual social classes	Little data	No data	
Breastfeeding	Shorter duration in manual social classes		Longer duration in manual social classes	

Table 3. Sexual partnership as reported in population-based studies

Author (country)	Sex, age	Sexual partnership	Socioeconomic status		
			Low (%)	High (%)	*P* value[a]
Leigh *et al.*, 1993 (USA)	Men & women: 42.8	≥5 partners in last 5 years	5.5	12.2	0.016
Seidman *et al.*, 1992 (USA)	Women: 15–44	≥ 2 partners 3 months before interview	6.5	2.6	<0.01
Laumann *et al.*, 1994 (USA)	Men & women: 18–59	>10 partners in adult lifetime	14.6	22.2	<0.01
Johnson *et al.*, 1994 (UK)	Men: 35–44	≥2 partners 1 year before interview	6.8	10.1	<0.01
	45–59		2.8	7.3	<0.01
	Women: 35–44	>1 partner 1 year before interview	4.4	4.1	0.89
	45–59		2.4	2.2	0.91
Spira *et al.*, 1994 (France)	Men: 18–69	>1 partner 1 year before interview	7.4	15.9	<0.01
	Women: 18–69	>1 partner 1 year before interview	3.0	7.6	<0.01
Melbye & Biggar, 1992 (Denmark)	Men: 18–59	>1 partner 1 year before interview	5.4	25.7	<0.01

[a] *P* values refer to the comparison between high and low socioeconomic status.

Occupational factors (Chapter 15)

Occupational exposures are responsible for about an estimated 4% of the total of human cancers in industrialized countries. These cancers, however, are concentrated among manual workers and in the lower social classes, thus contributing to the social class gradient in cancer incidence and mortality. An estimate from 1971 cancer mortality data for England and Wales assigns to occupational cancer about a third of the total difference between high (I, II and III-NM) and low (III-M, IV and V) social classes, and about a half of the differences for lung and for bladder cancer (Table 5). Direct evidence on the extent of the contribution of occupational exposure to carcinogens to social class differences is lacking. Several problems, such as possible interaction between carcinogens, and the effect of extraoccupational confounding factors, add further elements of uncertainty.

Unemployment (Chapters 16 and 17)

With a tenth of the labour force involuntarily out of work, unemployment has become an important element among the socioeconomic determinants of health in the rich countries (Chapter 16). Unemployed men have an excess cancer mortality of close to 25% compared with that of all men in the labour force (Table 6). The available data from England and Wales, Finland and Denmark (including recent data presented in Chapter 17) indicate that this excess risk is found both in periods when the unemployment rate is about 1% and in periods when it is around 10%. Furthermore, it persists long after the start of unemployment and the risk does not disappear when social class, smoking, alcohol intake, and previous sick days are controlled for. The excess risk comes mainly from lung cancer, and the excess risk of lung cancer does not disappear when social class and number of previous

Table 4. Prevalence of infection with *H. pylori* and prevalence of HBsAg by socioeconomic status – results of selected studies

Study	Population	Social class indicator	Category	Prevalence (%)
Sitas *et al.*, 1991 Prevalence of *H. pylori*	749 adults, UK	Registrar General's social class	I, II	49
			III	57
			IV, V	62
Fiedorek *et al.*, 1991 Prevalence of *H. pylori*	245 children, USA	Income of family	<US$ 5000/year	39
			>US$ 25 000/year	27
			US$ 5000–25 000/year	16
Patel *et al.*, 1994 Prevalence of *H. pylori*	554 children, UK	Persons per room	<0.5	10
			0.5–1.0	9
			>1.0	23
Awidi *et al.*, 1984 Prevalence of HBsAg	Volunteer blood donors, Jordan	Residence	Non-crowded urban areas	0.7
			Intermediate level urban areas	1.7
			Poor, crowded urban areas, refugee camps, rural areas	6.9

HBsAg, hepatitis B surface antigen.

Table 5. Ratios of cancer mortality between manual and non-manual social classes with and without excluding cancers attributable to occupational exposures (England and Wales, 1971)[a]

Cancer site	Crude rate ratio (Rc)[b]	Rate ratio for the proportion of cancers not attributable to occupation (R_a)[c]	Excess risk (%) attributable to occupation[d]
Liver	1.16	1.09	42
Larynx	1.76	1.71	5
Lung	1.71	1.37	48
Nose	1.38	0.90	100
Skin (non-melanoma)	1.77	1.55	29
Prostate	1.19	1.17	9
Bladder	1.36	1.17	52
All cancers	**1.40**	**1.27**	**32**

[a]Based on 25–64 years cumulative rates reported by Logan (1982). Only cancer sites that have been strongly related with occupational exposures are reported. Proportions of cancers attributable to occupation were derived from Doll & Peto (1981); all cancers related to occupation were assumed to occur among manual workers.

[b]Ratio of the rate among manual workers to the rate among non-manual workers.

[c]As crude rate ratio, after excluding cancers attributable to occupation (see Chapter 15 for details).

[d]Percentage of the crude rate ratio accounted for by cancers attributable to occupation, or $[(R_c - R_a) / (R_c - 1)] \times 100$.

Table 6. Total cancer mortality in unemployed men

Country, population	Study period	Age	SMR/RR	Reference[a]
Italy, 1981 census, mortality	1981–1985	15–59	1.75	Costa & Segnan, 1987
UK, 1971 census, mortality	1971–1981	15–64	1.44	Moser *et al.*, 1990
UK, 1981 census, mortality	1983	16–64	1.38	Moser *et al.*, 1987
UK, 1971 census, incidence	1971–1981	15–64	1.29	Kogevinas, 1990
UK, Regional Heart Study, mortality	1978/80–89	40–59	1.74	Morris *et al.*, 1994
Finland, 1980 census, mortality	1981–1985	30–54	1.39	Martikainen, 1990
Denmark, 1970 census, mortality	1970–1980	20–64	1.33	Iversen *et al.*, 1987
Denmark, 1970 census, incidence	1970–1975	20–64	1.25	Lynge & Andersen, 1996
Denmark, 1986 census, mortality	1986–1990	20–64	1.23	Lynge & Andersen, 1996
USA, 1979–1983, Current Population Survey, mortality	1979–1983	25–64	0.86	Sorlie & Rogot, 1990

SMR, standardized mortality ratio; RR, relative risk/rate ratio.

[a]See complete list of references in chapters by Lynge and by Lynge & Andersen in this volume.

sick days are controlled for. Unemployment does not increase smoking, but unemployed men have a slightly higher smoking prevalence before unemployment. However, as the excess lung cancer risk among unemployed men remains after controlling for social class it seems unlikely that it can be explained only by differences in smoking prior to unemployment.

Environmental factors (Chapter 18)

Exposure to a variety of environmental factors associated with cancer occurrence varies by social class. These factors include air pollutants (SO_2, NO_2, total suspended particles and so on), toxic waste hazards, and ionizing and other radiation. Heavy environmental pollution has been associated with an increased risk of some cancers and in particular lung cancer, and limited evidence suggests that individuals from low social classes are exposed to higher levels of environmental pollutants than individuals from high social classes. This may be due to the placement of new sources of pollution or of toxic processes in disadvantaged areas, or to the s elective migration of the poorer sectors of society to these areas. The available data do not allow any conclusion on the contribution to social class differences in cancer occurrence of exposure to environmental pollution. Exposure to ultraviolet (UV) radiation is due principally to sunlight, and is modified strongly by personal behaviours such as choice of recreation and use of protective clothing. Those in outdoor occupations are likely to receive the highest cumulative exposure to UV radiation. There is no clear evidence from recent surveys in Australia and North America that socioeconomic factors are strongly related to nonoccupational exposure to UV radiation. Information is lacking on the influence of socioeconomic status on sun exposure in other parts of the world. There is little information on the social distribution of exposure to ionizing radiation.

Socioeconomic status and cancer screening (Chapter 19)

The only widely applied cancer screening programmes are those for cervical and female breast cancer. Participation in breast cancer screening has been shown to depend on income and education, health insurance and type of health service. Women of low social classes tend to have lower screening participation rates than those in higher classes (Table 7). Socioeconomic differences in screening practices tend to decrease when participation is promoted, cultural and economic barriers are removed and social support is offered. In both developed and developing countries, women of low socioeconomic status have a higher than average risk of cervical cancer, and a lower than average participation in Papanicolaou smear screening.

Table 7. Sociodemographic differences in breast cancer screening – results from selected studies in the United States

Reference	Setting	Socioeconomic classification	Screening participation rate	Comments
Lane *et al.*, 1992	Telephone survey, Suffolk County, NY, USA; random sample of women aged 50–75 living in the community (*n*= 404) and of women using health centres (*n* = 795)	*Education*		Percentage use of mammography in community sample
		<12 years	17%	
		High school	25%	
		Post high school	24%	
		≥College graduate	49%	
		<12 years	27%	Percentage use of mammography in the health care centres sample
		High school	31%	
		Post high school	27%	
		≥College graduate	41%	
Fletcher *et al.*, 1993	Controlled intervention study, 1987–1990, in two communities of N. Carolina, USA; 1000 women aged 50–74	*Education*		
		≤High school	26%	Mammography utilization in the control community 1987
		>High school	39%	
		≤High school	33%	Mammography utilization in the control community 1989
		>High school	53%	
				Narrower differences in the intervention community
Kang *et al.*, 1994	Household Survey, 1986; 670 African-American women	*Education*		Logistic regression; odds ratios and 95% CIs for the use of routine mammography
		<High school	0.84 (0.46–1.54)	
		High-school grad.	1.0	
		1–3 years college	0.79 (0.39–1.59)	
		4+ years college	1.31 (0.49–3.47)	
Urban *et al.*, 1994	Washington state, 1984; telephone survey of 1538 women aged 50–75	*Income*		Percentage of women aged 50–64 having mammography within one year of interview
		<US$ 15 000	27%	
		>US$ 15 000	48%	
		Unknown	37%	
		<US$ 15 000	41%	Percentage of women aged 50–64 never having a mammography
		>US$ 15 000	18%	
		Unknown	29%	
Reeves *et al.*, 1995	Wisconsin Tumour Registry, USA, 1988–1990; 3197 women with breast cancer	*Education*		Logistic regression; odds ratios and 95% CIs. Mammographic detection compared with self-detected cancer. No differences observed for CBE versus self-detected cancer.
		<High school	1.0	
		High-school grad.	1.2 (0.9–1.6)	
		Some college	1.3 (0.9–1.7)	
		College graduate	1.5 (1.0–2.1)	
Anderson *et al.*, 1995	National Health Interview Survey, Cancer Control Supplement, USA; 5052 women older than 40 years in 1987 and 2709 women in 1992	*Education*		Reported use of mammography, 1987
		<12 years	15%	
		12 years	25%	
		>12 years	31%	
		<12 years	36%	Reported use of mammography, 1992
		12 years	52%	
		>12 years	61%	

CBE, clinical breast examination; grad., graduate.

Explanations for social class differences in cancer patient survival (Chapter 20)

Social class differences in cancer patient survival have been reported for most cancer types and in a number of countries. The source of these differences has been studied less thoroughly and less systematically than social class differences in cancer occurrence. Stage of disease at diagnosis appears to be the most important factor contributing to the social class differences in cancer patient survival, although the evidence is not always consistent (Table 8). This has been observed most clearly for gastrointestinal and gynaecological cancers. Differences in survival are generally wider with localized than with advanced stages of disease. The reasons why cancers are more frequently diagnosed at a local stage in high than low social classes is not fully understood at the moment. Of other potential contributing factors, the role of treatment and psychosocial factors has scarcely been studied.

Table 8. Proportion of cases of various cancers diagnosed at a local stage, by socioeconomic status

Reference; country	Socioeconomic classification	Colon	Rectum	Lung	Female breast	Uterine cervix	Uterine corpus	Bladder	Prostate
Linden, 1969; USA	County				82%				
	Private				83%				
Lipworth *et al.*, 1970; USA	<US$ 5000	9%	9%	2%		35%	35%	39%	27%
	>US$ 5000	10%	16%	8%		45%	46%	36%	16%
Lipworth *et al.*, 1972; USA	Non-private	34%	53%	13%	31%	38%	48%	66%	57%
	Private	30%	36%	24%	40%	35%	60%	63%	52%
Berg *et al.*, 1977; USA	Indigent	35%		15%	35%	69%		70%	49%
	Non-indigent	37%		19%	38%	75%		75%	44%
Keirn & Metter, 1985; USA	Indigent	34%		34%	45%				
	Non-indigent	29%		29%	35%				
Dayal *et al.*, 1987; USA	Low	34%	34%						
	Medium	42%	42%						
	High	44%	44%						
Karjalainen & Pukkala, 1991; Finland	I (high)				51%				
	II				51%				
	III				48%				
	IV (low)				47%				
Brenner *et al.*, 1991; Germany (colorectal)	Low	54%							
	Medium	58%							
	High	51%							
Kato *et al.*, 1992; Japan	Non-employed	33%							
	Service	36%							
	Production	42%							
	Clerical	46%							
	Professional	38%							
Auvinen, 1992; Finland	I (high) 44%	44%							
	II 41%	41%							
	III 42%	42%							
	IV (low) 37%	37%							

Biological indicators of tumour aggressiveness have failed to explain the social class differences.

Conclusions

Clear evidence from industrialized and less developed societies shows that both cancer incidence and cancer survival are related to socioeconomic factors. Lower social classes tend to have higher cancer incidence and poorer cancer survival overall rates than higher social classes, although this pattern differs for specific cancers. Social class differences in cancer incidence can, in part, be explained by known risk factors. Tobacco smoking appears as the single most important mediating factor for the occurrence of socioeconomic differences in cancer. The extent to which tobacco smoking 'explains' socioeconomic differences in one or more of the cancers that it causes has rarely been directly addressed in epidemiological studies. Occupation, reproductive behaviour and biological agents (HPV, *H. pylori*, HBV and HCV) have also been shown to be important mediating factors for the occurrence of socioeconomic differences in cancer incidence. The main factor associated with the poorer survival of cancer patients of low socioeconomic status is stage of the cancer at diagnosis, although the evidence showing that cancer patients of low social classes present at a later stage has not always been consistent. For breast and cervical cancer, the differences in stage at diagnosis may, in part, be attributed to the differential use of cancer screening programmes. Studying the magnitude of socioeconomic differences and the mediating factors for the occurrence of these differences provides valuable information for the prevention of health inequalities. At this time, however, there is insufficient evidence to discriminate between socioeconomic factors, the social distribution of specific cancer risk factors and the overall 'package' of social inequality.

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