Chapter 7. Social inequalities in cancer risk factors and health-care access

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Summary of key points

- Several factors underlie the large inequalities in cancer outcomes and cancer profiles observed between and within countries.
- Lifestyle factors such as tobacco use, unhealthy diet, and excessive alcohol consumption are generally more prevalent among low-income populations.
- Cancer risks are unequally distributed across occupational groups; as a consequence of exposure to carcinogenic agents specific to their employment and other risk factors associated with their typically lower socioeconomic status, manual workers are most severely affected. Inequalities in cancer from environmental exposures may arise from many causes.
- Infection-related cancers and most carcinogenic infections are also characterized by a strong socioeconomic gradient.
- Differences in cancer outcomes between groups of different socioeconomic status are likely to relate to differences in access to high-quality care.

Introduction

Social gradients in cancer show complex patterns between and within countries (as documented in Chapters 5 and 6), which are driven by a multifaceted and concurrent interplay of different factors. Although all-cancer incidence rates are generally higher in more developed countries and generally increase with increasing levels of national socioeconomic development, the gradient is less clear for all-cancer mortality rates. Caution is certainly needed when interpreting cancer patterns between countries, because these are characterized by substantial heterogeneity and several exceptions. Within countries, however, mortality for the majority of cancer types is disproportionately higher in groups with low socioeconomic status (SES) for almost all countries globally. The spectrum of certain types of cancer also varies with social condition. Infection-related cancers are generally more frequent in disadvantaged individuals and in inhabitants of low-income countries; other cancers, such as those of the breast, prostate, thyroid, and colon and rectum, have been, at least historically, associated with affluence. The social gradient in cancer may change over time, however, or even reverse. Countries that are undergoing a transition towards higher socioeconomic levels have, on average, higher standards of living, a wider range and larger supply of goods and services, higher life expectancy, and a lower rate of infection-related cancers. However, these improvements are often accompanied by changing environments, which support the uptake of certain cancer-causing behaviours and increased exposure to risk factors, affecting predominantly less affluent groups. High-quality health care, from prevention and early detection to treatment, is therefore of great importance in controlling and reducing cancer mortality. However, its availability is often prohibitive for people residing in less developed countries and limited for disadvantaged individuals in more developed countries, thus increasing social inequalities in cancer. Here, we provide a summary of the evidence on the social inequalities that exist in the distribution of major risk factors for cancer as well as in the availability of and access to early detection and treatment of the disease, with a focus on how these inequalities have an impact across the whole cancer continuum. The mechanisms and the context underlying social inequalities in the risk factors for cancer and health-care access, and consequently cancer outcomes, are discussed in Part II of this publication.

Lifestyle factors

According to IARC, many cancer types are causally associated with tobacco use, alcohol consumption, and excess body weight (Table 7.1). Several cancers have also been associated with unhealthy diet (WCRF/AICR, 2018a). Tobacco use accounts for 21% of total cancer deaths worldwide, followed by unhealthy diet (8%), alcohol consumption (7%), and excess body weight (5%). The burden of these major risk factors varies within and across countries according to SES and other factors, such as: the level of economic development and transition to lifestyles typical of industrialized countries; the activities of the tobacco, fast food, sugar-sweetened beverage, and liquor industries; and public health policies (see Example 1 and Chapters 10 and 11).

Table 7.1. Cancer types associated with tobacco smoking, alcohol consumption, and excess body weight according to IARC, and the magnitude of the associations

Exposure	Cancer type	Relative risk[a]
Tobacco smoking	Oral cavity and pharynx	5.7
	Oesophagus	4.3
	Stomach	1.8
	Colon and rectum	1.5
	Liver	2.1
	Pancreas	1.7
	Nasal cavity and paranasal sinuses	Not reported
	Larynx	17.4
	Lung	23.9
	Uterine cervix	1.9
	Ovary (mucinous)	Not reported
	Kidney (body and pelvis) and ureter	1.6
	Urinary bladder	3.9
	Bone marrow (myeloid leukaemia)	1.6
Alcohol consumption	Oral cavity and pharynx	3.1
	Oesophagus (squamous cell carcinoma)	3.6
	Liver	1.1
	Colon and rectum	1.4
	Larynx	1.1
	Female breast	1.5
Excess body weight	Oesophagus (adenocarcinoma)	1.5
	Stomach (cardia)	1.2
	Colon and rectum	1.1
	Liver	1.3
	Gallbladder	1.3
	Pancreas	1.1
	Female breast (postmenopausal)	1.1
	Corpus uteri	1.5
	Ovary	1.1
	Kidney	1.3
	Meningioma	1.2
	Thyroid	1.1
	Multiple myeloma	1.1

BMI, body mass index

[a] Relative risks for tobacco smoking are for current versus never smokers (Carter et al., 2015); for alcohol use are for heavy drinking (> 50 g of alcohol or > 4 drinks per day) versus non-drinkers (Bagnardi et al., 2015); and for excess body weight are per 5 kg/m^2 increase in BMI, except for meningioma (overweight [BMI 25–29.9 kg/m^2] versus normal weight). Relative risks for excess body weight are from WCRF/AICR (2018b), except for those for meningioma (Niedermaier et al., 2015), thyroid cancer (Kitahara et al., 2016), and multiple myeloma (Teras et al., 2014).

Source: compiled from Carter et al. (2015), Bagnardi et al. (2015), WCRF/AICR (2018b), Niedermaier et al. (2015), Kitahara et al. (2016), and Teras et al. (2014).

Before the health hazards of smoking became public knowledge in the middle of the 20th century, in many high-income countries (HICs) the prevalence of smoking was highest in groups with higher SES. Over time, however, the burden of smoking shifted to groups with lower SES, because of inequalities in risk awareness and access to counselling and treatment services for tobacco dependence, combined with highly effective targeted marketing of tobacco to more disadvantaged populations (Fig. 7.1) (Allen et al., 2017; Casetta et al., 2017; Sreeramareddy et al., 2018). A similar shift in the burden of smoking has occurred in many low- and middle-income countries (LMICs), particularly among men (Islami et al., 2015; Allen et al., 2017; Casetta et al., 2017; Sreeramareddy et al., 2018). In the few remaining low-income countries where the prevalence of smoking is still higher in groups with higher SES (Sreeramareddy et al., 2018), the burden is expected to shift to groups with low SES and other disadvantaged groups (e.g. ethnic minorities and Indigenous populations) in the foreseeable future, unless concerted efforts are made to promote and apply tobacco control measures (Islami et al., 2015).

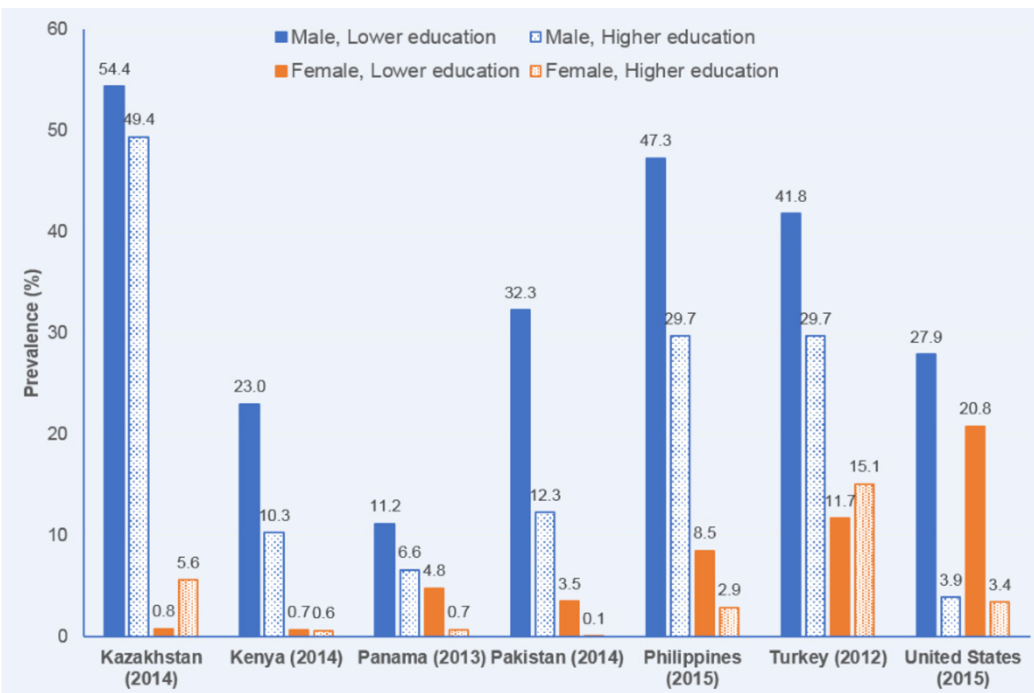

Fig. 7.1. Current smoking prevalence among adults by sex and education level in selected countries. A lower education level was defined as elementary/primary school in Panama, Philippines, and Turkey, primary school or less in Kazakhstan, less than primary school in Kenya, and 0–12 years of school with no diploma in the USA. A higher education level was defined as college/university or above in Kazakhstan, Panama, Philippines, and Turkey, secondary school completed or above in Kenya, and graduate degree in the USA. Source: compiled from the National Health Interview Survey for the USA and the Global Adults Tobacco Survey (WHO, 2018b) for other countries.

Although the prevalence of alcohol consumption is generally greater among people with higher versus lower SES, epidemiological studies suggest that people with lower SES and disadvantaged groups are at higher risk of some alcohol-related diseases, including head and neck cancers (Jones et al., 2015). This is largely thought to be due to higher rates of excessive drinking (e.g. binge drinking) among lower-SES individuals (Grittner et al., 2013). Compared with people in affluent neighbourhoods, those in poorer neighbourhoods have a higher degree of stressors and fewer means to cope with them (Grittner et al., 2013) and the density of liquor stores is higher in poorer neighbourhoods (Berke et al., 2010). In LMICs, unrecorded (i.e. home-made) alcohol, which is more affordable than commercial alcohol, is consumed excessively, especially among the low-income population (WHO, 2018a). The World Health Organization estimates that unrecorded alcohol accounts for 9% of total alcohol consumption in HICs, 24% in upper-middle-income countries, and 40% in other LMICs (WHO, 2018a) (see Chapter 11).

The prevalence of excess body weight has substantially increased globally in recent decades, because of the increased availability of low-cost, calorie-dense foods and the adoption of a more sedentary lifestyle (Abarca-Gómez et al., 2017; Bann et al., 2017). About 13% of the world's adult population is obese (body mass index $\geq$ 30 kg/m^2), and the prevalence is as high as 50% among women in parts of the Middle East and North Africa (Fig. 7.2) (Abarca-Gómez et al., 2017). In most HICs, people with lower SES are more likely to be obese or overweight than those with higher SES (Devaux and Sassi, 2013; Bann et al., 2017). However, in some low-income countries (especially in parts of sub-Saharan Africa), the prevalence of overweight or obesity is often higher in people with higher SES and in urban areas (Madise and Letamo, 2017).

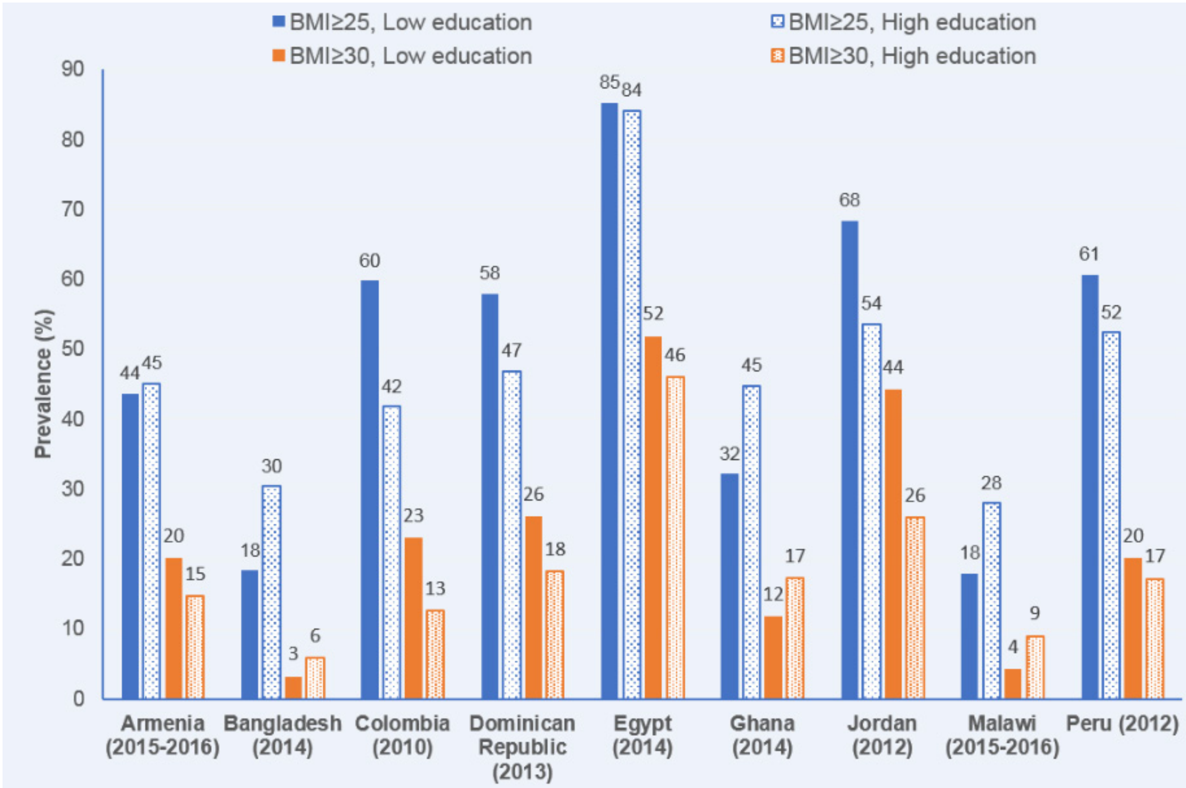

Fig. 7.2. Prevalence of excess body weight (BMI ≥ 25 kg/m2) and obesity (BMI ≥ 30 kg/m2) among women aged 15–49 years by education level in selected low- and middle-income countries. Lower and higher education levels were defined as no education or primary education only and secondary or higher education, respectively. BMI, body mass index. Source: compiled from the Demographic and Health Surveys (https://dhsprogram.com/).

A major limitation in assessing SES inequalities in tobacco use, alcohol consumption, and unhealthy diet is a lack of representative data, particularly from LMICs. Evidence is therefore often based on small-scale epidemiological studies or surveys with heterogeneous inclusion criteria, some of which are conducted in clinics or urban areas only. There are also limited data on determinants of inequalities, and on the best ways to implement effective preventive measures in each population. More research on the implementation of effective interventions at the community and individual levels is also needed in both LMICs and HICs. However, the prevalence of tobacco use, alcohol consumption, and unhealthy diet in middle- and high-income countries is generally higher among low-income populations, mainly because of inequalities in the application of effective interventions and in targeted marketing by the tobacco, fast food, sugar-sweetened beverage, and liquor industries. Elimination of this inequality requires public policies for equitable access to health care, policies against deceptive industry advertising, and programmes for the broad application of effective interventions.

Occupational exposures

The history of occupational epidemiology includes recognition that manual workers face unequal cancer risks as a result of varying levels of exposure to carcinogenic agents specific to their employment, and as a consequence of other risk factors associated with their typically lower SES. Formal investigation of the links between occupation and cancer was a development of the 20th century, via an exploration of the health effects of exposure to carcinogens in the mining and manufacturing industries (e.g. Pirchan and Sikl, 1932; Doll, 1952; Case et al., 1954). Subsequent research has facilitated the identification of at least 70 agents, mainly chemicals, metals, airborne particles, and radiation, as occupational carcinogens (Loomis et al., 2018).

Cancer risks are distributed unequally across occupational groups, with manual workers being the most severely affected (Hart et al., 2001; Vanthomme et al., 2017). Large surveys have shown that skilled and unskilled workers in occupations such as vehicle repair, metallurgy, and metal- or wood-working and in the chemical industry are often exposed to complex mixtures of carcinogenic substances (European Foundation for the Improvement of Living and Working Conditions, 2010, 2013, 2015). Reflecting both the uneven distribution of occupational cancer hazards and their often-complex nature, 12 different occupations (e.g. painters) and industries (e.g. rubber manufacturing) typically employing blue-collar workers are classified by the IARC Monographs as carcinogenic to humans (Loomis et al., 2018).

Even within occupations, important exposure and health disparities exist (Quinn et al., 2007). For example, mortality studies in United States steel workers revealed striking differences in cancer risk among groups defined by occupation, work location, and race; for respiratory cancer mortality, the highest rates were seen among African-American, compared with White, workers on the topside of coke ovens, who were believed to have the heaviest exposures to coke oven emissions (Lloyd, 1971; Birdsey et al., 2007). Disentangling the contribution of factors such as place of residence and access to health care from occupational exposure to carcinogens remains challenging. Occupational cohort studies typically lack data on workers' personal and social attributes, and are consequently unable to investigate influences beyond the workplace.

To address these challenges, researchers have used population-based studies to investigate the role of occupation in inducing cancer disparities. For example, in a study of mortality from potentially work-related cancers in 21 states of the USA, African-Americans experienced higher mortality from leukaemia and cancers of the lung, nasal cavity, and peritoneum relative to the average for all workers in the same age range (Loomis and Schulz, 2000). A study within the multicentre European Prospective Investigation into Cancer and Nutrition cohort showed that exposure to asbestos, heavy metals, and polycyclic aromatic hydrocarbons explained 14% of the socioeconomic inequalities observed in lung cancer incidence in men, independent of smoking and dietary factors (Menvielle et al., 2010). A recent study evaluated socioeconomic differences in adult cancer mortality in Belgium, using occupational group and employment status as measures of SES, to test the theory that inequalities in cancer arise largely from the differential distribution of economic resources (Vanthomme et al., 2017). Among the employed, inequalities in cancer mortality were observed by occupation, especially for cancers that are largely preventable.

Finally, ever-increasing economic globalization has amplified geographical aspects of occupational cancer disparities. For example, the adoption of bans or restrictions on the use of asbestos has probably helped to limit mesothelioma rates in certain HICs (Nishikawa et al., 2008). Without active intervention to reduce exposures in LMICs, the cancer burden from occupational exposures may continue to shift to these more vulnerable workers.

Environmental exposures

Inequalities in cancer from environmental exposures may arise from many causes. For example, poor indoor air quality can result from the use of coal-burning cooking stoves in unventilated homes; such practices, which are more frequent in LMICs, have been linked to lung cancer (Lan et al., 2002). Within a particular country, people experiencing poverty may live in areas with greater concentrations of carcinogens in air, soil, or water than compared with areas where less deprived people live (Huang et al., 2017). Research on ambient air pollution provides an illustrative example of the scale of disparities between and within countries. Outdoor air pollution is classified by IARC as Group 1 (carcinogenic to humans) (Loomis et al., 2013; IARC, 2016), causing lung cancer. WHO has estimated that outdoor air pollution accounted for about 400 000 lung cancer deaths worldwide in 2012 (WHO, 2016), representing 14% of the total mortality burden attributable to ambient air pollution. The same publication reported how unequally this burden was distributed within and across regions, with LMICs having the highest air-pollution-related lung cancer mortality and morbidity (Fig. 7.3). Social inequalities in the risk of lung cancer associated with exposure to outdoor air pollution can be demonstrated within a single country, region, or even city. Exposure to air pollution (Huang et al., 2017) and the incidence of related cancer (Apelberg et al., 2005) in the USA are highest for census tracts with high percentages of racial and ethnic minorities and of those living in poverty, although adjustment for smoking remains a challenging issue. A cohort study of mortality among more than 1 million adults in Rome, Italy, showed gradients of increasing mortality risk ratios for exposure to fine particulate matter with area-based SES and education level (Cesaroni et al., 2013). Also, ethnically diverse neighbourhoods have the highest levels of air pollution in England and the Netherlands (Fecht et al., 2015). A better understanding of how environmental exposures and air pollution are distributed across the geographical space, particularly in disadvantaged areas, is therefore crucial to address environmental inequalities in cancer.

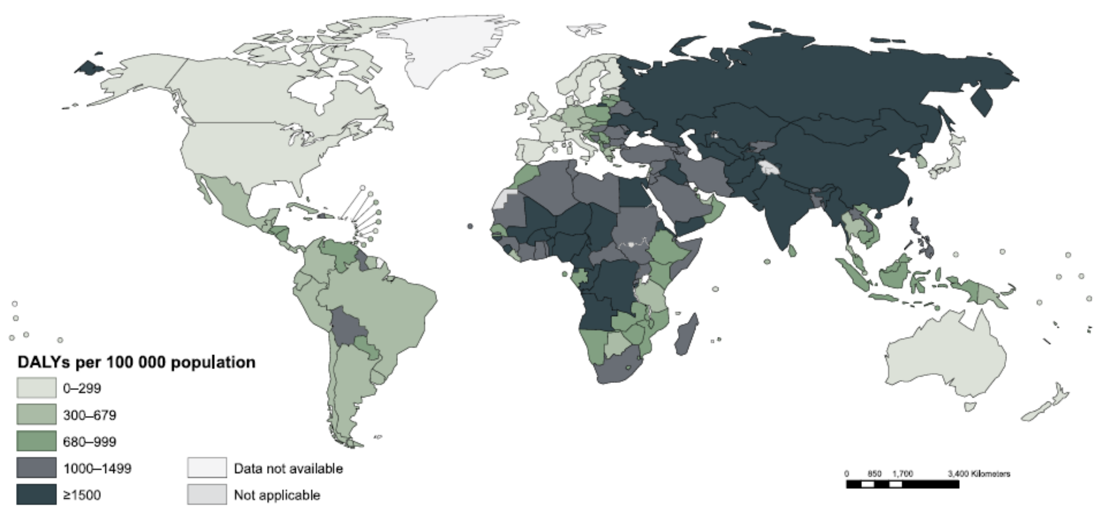

Fig. 7.3. Age-standardized disability-adjusted life years per 100 000 people attributable to ambient air pollution in 2012, by country. Source: reprinted from WHO (2016, p. 43).

From a life-course perspective, in utero or early-life exposure to environmental carcinogens may substantially increase future disparities in cancer incidence and mortality. For example, unsafe management practices related to the disposal and recycling of end-of-life electrical and electronic equipment, so-called e-waste, have greatly increased in the past two decades in LMICs such as China, Ghana, India, Nigeria, the Philippines, Thailand, and Viet Nam. E-waste handling can entail exposure via multiple routes to mixtures of many hazardous and often carcinogenic chemicals (e.g. arsenic, cadmium, chromium, and persistent organic pollutants, such as dioxins) (Baldé et al., 2015). Children or pregnant women are often involved in these unregulated activities or live in the surrounding contaminated areas. They may also be exposed through take-home contamination from a family member (Ceballos et al., 2017). Although the short-term health effects of e-waste exposure have been described, including pregnancy complications, adverse neonatal outcomes, and reduced lung function in children (Grant et al., 2013), the long-term effects on cancer risk remain largely unknown.

Infections

Infections with viruses, bacteria, and parasites have long been identified as strong risk factors for specific cancers (IARC, 2012) (Table 7.2). Worldwide, about 2.2 million (15.4%) of the total of 14 million new cancer cases that occurred in 2012 were attributable to infections. Of these, 770 000 were caused by *Helicobacter pylori*, 640 000 by human papillomavirus (HPV), 420 000 by hepatitis B virus (HBV), and 170 000 by hepatitis C virus (HCV) (Plummer et al., 2016).

Table 7.2. Cancer types and associated IARC Group 1 (i.e. carcinogenic to humans) infectious agents

Cancer type	Infectious agent (IARC Group 1)
Stomach	*Helicobacter pylori*
Liver (hepatocellular carcinoma and cholangiocarcinoma)	Hepatitis B virus, hepatitis C virus, *Opisthorchis viverrini*, *Clonorchis sinensis*
Cervix uteri	Human papillomavirus
Anogenital (penile, vulva, vagina, anus)	Human papillomavirus
Nasopharynx	Epstein–Barr virus
Head and neck (oropharynx, larynx, oral cavity)	Human papillomavirus
Non-Hodgkin lymphoma	*Helicobacter pylori*, Epstein–Barr virus, hepatitis C virus, human T-cell lymphotropic virus type 1 (HTLV-1)
Kaposi sarcoma	Human herpesvirus type 8/Kaposi sarcoma-associated herpesvirus (KSHV)
Hodgkin lymphoma	Epstein–Barr virus
Bladder	*Schistosoma haematobium*

Source: compiled from IARC (2012).

The population-attributable fractions of infection-related cancers vary greatly by average level of socioeconomic development, as measured by the Human Development Index (HDI); the proportion of new cancer cases attributable to infections is highest (20–25%) in countries with medium and low HDI, intermediate (13.2%) in countries with high HDI, and lowest (7.6%) in countries with very high HDI (Plummer et al., 2016; see also Chapter 5). In absolute terms, half of the burden of infection-associated cancers (i.e. 1.1 million cases) occurs in countries with medium HDI. (At the time of the study this classification included China, a country with approximately half of the global burden of gastric cancer and liver cancer; more recently, China was reclassified as a high-HDI country.) The absolute burden of infection-related cancers is expected to increase in countries with medium HDI, because of the large number of adults who were infected with carcinogenic microbes such as HBV or *H. pylori* in childhood.

Infection-related cancers are characterized by a strong socioeconomic gradient. The link between infections and cancer is reviewed here for some of the most important carcinogenic pathogens.

H. pylori infection

The bacterium *H. pylori* is estimated to cause 90% of non-cardia gastric cancer (Plummer et al., 2015). More than 70% of gastric cancer cases in 2012 occurred in countries in eastern Asia and Latin America, and 42% of all global cases of non-cardia gastric cancer in 2016 occurred in China alone (Ferlay et al., 2015). The incidence of gastric cancer was very high in HICs in Asia, such as Japan and the Republic of Korea. *H. pylori* is transmitted mainly in early childhood within the family, and often during bouts of gastroenteritis. Within any country or population, *H. pylori* infection and the resulting gastric cancer disproportionately affect more disadvantaged groups (Power et al., 2005; Nagel et al., 2007).

Globally, the incidence and mortality rates of gastric cancer are declining by approximately 2.5% per year, partly because of the slow disappearance of *H. pylori* that accompanies the general progressive access to better living conditions (de Martel et al., 2013). However, because of the growth and ageing of the world population, the total numbers of newly diagnosed cancer cases and deaths have continued to increase. The best strategy to control non-cardia gastric cancer is through screening and the eradication of *H. pylori* using a combination of antibiotics and a proton-pump inhibitor (Ford et al., 2005; Herrero et al., 2014). Implementation studies of such strategies are currently in progress in several countries, and are being carefully monitored with the aim of helping others to develop their own guidelines (Bae et al., 2018).

HPV infection

Persistent infection of the genital tract with high-risk HPV types is a known, necessary cause of pre-invasive and invasive cancer of the cervix. HPV is also associated with cancer of the vagina, vulva, anus, oropharynx, and penis (De Vuyst et al., 2009; Miralles-Guri et al., 2009). HPV prevalence varies substantially by country and is highest in sub-Saharan Africa; however, like sexual habits, it is not clearly correlated with poverty. The strong excess risk of cervical cancer observed in less affluent individuals and in LMICs is due to the limited availability of and access to organized, or even opportunistic, screening. The contribution of other cofactors linked to low SES, such as smoking, multiparity, and coinfection with HIV, may also play a role (Bosch and de Sanjosé, 2007).

Effective vaccination against HPV infection is now available; more details are provided in Example 2.

HBV infection

In total, 56% of liver cancer cases worldwide are attributable to chronic HBV infection (Maucort-Boulch et al., 2018). In 2015, WHO estimated that 257 million people were chronic carriers of HBV worldwide, including 9 million children younger than 5 years. In children, transmission of the virus may occur perinatally or horizontally (from siblings or close family members), whereas in adults, the virus is transmitted mainly through the reuse of needles and syringes in health-care settings or among people who inject drugs. Countries with high HBV endemicity (5–10%) are mainly located in sub-Saharan Africa and eastern Asia. Intermediate rates of chronic infections (2–5%) are found in populations of the Amazon countries, the southern parts of eastern and central Europe, and the Middle East (Fig. 7.4).

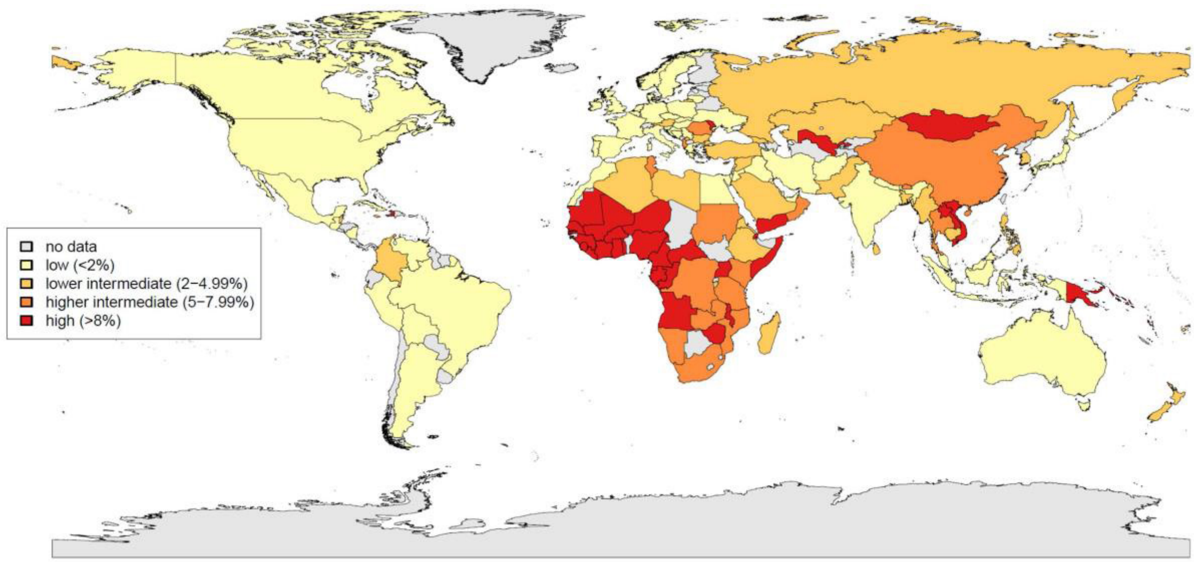

Fig. 7.4. Global endemicity of hepatitis B virus (HBV) infection (1990–2013). The estimated prevalence of chronic HBV infection (HBsAg seroprevalence) is based on pooled data from all eligible studies for each country from 1990–2013. Source: reprinted from Schweitzer et al. (2015), Copyright (2015), with permission from Elsevier.

Since the initial recommendation of universal HBV immunization by WHO in 1992, and the subsequent endorsements of the use of a monovalent birth dose given within the first 24 hours of life, the number of countries that include HBV vaccine in their national vaccination schedules has been constantly increasing, and temporal trends indicate a decrease in the prevalence of chronic carriers in many areas (Ott et al., 2017). However, access to a safe and efficient health-care system is difficult in the poorest countries and for deprived population groups, in which the virus is most prevalent (WHO, 2017). In the near future, the reservoir of people living with chronic HBV and the resulting disease burden may increase in highly industrialized, low-endemicity countries that receive migrants from areas with high HBV endemicity (Sharma et al., 2015).

HCV infection

HCV is one of the major risk factors for hepatocellular cancer, accounting for about 20% of cases of the disease globally (Maucort-Boulch et al., 2018). In 2015, WHO estimated that 71 million people were living with chronic HCV infection, with the prevalence varying between countries. HCV infection is concentrated in certain populations at higher risk and/or in the general population of certain HCV-endemic countries (e.g. Egypt and Mongolia). Higher-risk groups include people who inject drugs, recipients of contaminated blood products or unsafe injections in health-care settings, people with HIV infection, prisoners or previously incarcerated people, and people who have had tattoos or piercings. As a result, in countries with a low prevalence of HCV infection (e.g. the Netherlands), the infection is more prevalent in groups with lower SES (Vriend et al., 2013); in countries with high prevalence and long-established endemicity, the infection is common in groups with all levels of SES.

Access to the new, efficient, but very expensive HCV treatment is improving but remains limited. According to WHO, of the 71 million people living with HCV infection in 2015, only 20% (14 million) knew their diagnosis and only 1.1 million were receiving treatment (WHO, 2017). In addition to effective screening, the main barrier to receipt of treatment and subsequent cure is the cost, but prices have dropped dramatically in some countries (primarily low-income countries) as a result of the introduction of generic versions of antiviral medicines (Aggarwal et al., 2017).

Early diagnosis and screening

Differences in cancer outcomes between social groups may be partially related to differences in access to care. Stage at diagnosis is a critical factor that determines not only the types of treatment available but also the chances of survival. However, early diagnosis of cancer requires access to screening and diagnostic services. Individuals in underserved populations face practical, geographical, and economic barriers to accessing services. In addition, factors relating to social distance between individuals and their health-care practitioner, cultural alienation, and previous negative experiences within health-care systems also act as barriers to access (Dixon-Woods et al., 2006). These barriers vary in scope and magnitude in different settings, and collectively are important drivers for social disparities in cancer survival in HICs and LMICs. Multiple strategies are therefore required that consider information about those affected and their practical needs to improve access to and progress through the health system (Legler et al., 2002; Institute of Medicine, 2003; Niksic et al., 2015).

Screening programmes can either diminish or widen disparities, depending on how they are designed, implemented, and monitored (von Wagner et al., 2009; Chiou et al., 2014; Kim et al., 2015; Douglas et al., 2016; Kelly et al., 2017). Typically, uptake of screening is higher among those in more advantaged groups, but there are examples of programmes that have succeeded in reducing unequal uptake by focusing on reducing barriers for underserved populations (Legler et al., 2002; von Wagner et al., 2009; Palència et al., 2010). For many countries, however, effective screening is still not being implemented, even for cancers that have been found suitable for early detection in LMICs; this is due to the substantial costs needed to provide the infrastructure, human resources, consumables, follow-up, and surveillance for screening, not to mention competing health demands. As an example, screening to prevent cervical cancer has not been initiated or sustained in the majority of LMICs because of the complexity of cytology-based screening algorithms and the need for: functional and quality-assured laboratories, technicians, and pathologists; strong health-care systems; and reliable referral pathways. However, a lack of cervical cancer screening and high rates of cervical cancer also affect countries in eastern Europe and the Baltic region with very high HDI, for example, Estonia (Vaccarella et al., 2016).

Treatment

In HICs, there is compelling evidence that individuals in less privileged groups receive lower-quality treatment for cancer than those in more privileged groups (Shavers and Brown, 2002; Institute of Medicine, 2003; Hill et al., 2013). The drivers behind these differences are likely to be multifactorial, relating to patient factors including comorbidity, accessibility of health services, and the quality of care received within those services. Globally, there are enormous inequalities in cancer treatment in both quantity and quality (IAEA, 2011). For example, on average, one radiotherapy unit is available for every 120 000 inhabitants in HICs, one radiotherapy unit is available for every 1 million individuals in middle-income countries, and no radiotherapy services are available in 51 countries, independent territories, and islands (IAEA, 2017). The use of cytotoxic drugs is similarly imbalanced worldwide, largely because of the need for adequate hospital, diagnostic, and clinical laboratory facilities and qualified human resources, which are strongly influenced by educational and social factors.

There are also considerable variations across countries in the financing of cancer treatments, in terms of public contributions, out-of-pocket expenses, and drug costs (Prager et al., 2018). Such financial toxicity of cancer care, particularly in countries with inadequate safeguards, either pushes individuals into poverty or forces them to make difficult decisions in terms of cancer treatment. These barriers to effective, acceptable, and timely cancer care result in poorer survival outcomes and quality of life, with the most vulnerable individuals disproportionately affected. Provision of universal health coverage is therefore essential to achieve equity (Andrulis, 1998; Asaria et al., 2016); however, even in countries which have implemented universal health coverage, monitoring of health system performance is required because some vulnerable populations can receive lower standards of care (Institute of Medicine, 2003; Wrigley et al., 2003; Woods et al., 2006; Hill et al., 2013).

Palliative care

Studies on palliative care have only been taken up recently, mainly in HICs despite the greater need for, and lack of, palliative care in LMICs. Social and cultural beliefs, local regulations, and support in obtaining palliative care all highly influence the use of palliative and hospice care. In HICs, provision of, access to, and use of palliative care have been reported to be lower among less advantaged groups and among older cancer cases and cases without informal care provider. In addition to improved public funds and legal access to opioid drugs, price regulation of such drugs, and better education to tackle false beliefs, innovating palliative care methods such as home-based care could greatly improve quality of life and reduce the marked inequality between many cancer patients at the end of life.

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