11 Cancer

Burden, epidemiology and principles for priority interventions

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This chapter provides a brief overview of the burden, epidemiology, public health impact and main principles for the prevention and treatment of cancer, one of the four diseases in the WHO Global NCD Action Plan. Cancer has a significant socio-economic impact on individuals and their families. A substantial proportion of cancer cases is attributable to the main modifiable NCD risk factors (e.g. tobacco, unhealthy diet, alcohol, physical inactivity). A small number of cancers (e.g. breast, cervical, colorectal and prostate), that together are responsible for 30% of all cancer cases, are described in more detail in other chapters.

Disease burden

Epidemiological data on cancer are widely available.[1,2,3,4] Cancer causes one in six deaths globally. Lung, prostate, colorectal, stomach and liver cancers are the most common types of cancer in men, while breast, colorectal, lung, cervical and thyroid cancers are the most common among women. As the incidence of cancer sharply increases with age, the lifetime risk of developing cancer is large, e.g. 40–50% among men and 35–45% among women where life expectancy at birth exceeds the age of 75–80 years. Table 11.1 provides data on the leading causes of cancer deaths.[5] Overall, the total number of people, or proportions of the population, with cancer has increased between 1990 and 2019 in all country-income group categories. However, the age-adjusted mortality rates for cancer as a whole (which express the risk of developing cancer irrespective of population growth and age distribution) have decreased in all country-income groups, although there has been an increase for a few specific cancers (e.g. colon cancer in all country-income groups except HICs).

Cancer trends

The projected number of people living with, or dying from, cancer depends on changes in several variables: life expectancy and population growth, exposure to risk factors, screening and treatment. As a result, the total number of cancer cases will increase in the coming years in most populations, particularly in low- and middle-income countries. However, the trends in age-adjusted

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Table 11.1 Mortality and fractions of mortality attributable to modifiable risk factors for leading cancers

	All cancers		*Lung*		*Colon*		*Stomach*		*Breast*		*Oesophagus*		*Prostate*		*Liver*		*Cervix*	
	1990	*2019*	*1990*	*2019*	*1990*	*2019*	*1990*	*2019*	*1990*	*2019*	*1990*	*2019*	*1990*	*2019*	*1990*	*2019*	*1990*	*2019*
Number of deaths (10^6)	5.75	10.1	1.1	2.0	0.52	1.1	0.78	0.96	0.38	0.70	0.32	0.50	0.23	0.49	0.37	0.48	0.19	0.28
Percent of all deaths																		
All countries	12.3	17.8	2.3	3.6	1.1	1.9	1.7	1.7	0.82	1.2	0.68	0.88	0.50	0.86	0.78	0.86	0.40	0.50
High income	25.1	28.9	5.7	6.4	3.2	3.8	2.3	1.7	2.0	1.9	0.65	0.80	1.4	1.8	0.7	1.2	0.38	0.31
Upper middle income	15.9	22.1	2.9	5.3	1.1	2.3	3.0	2.9	0.70	1.1	1.4	1.6	0.4	0.82	1.7	1.3	0.46	0.56
Lower middle income	5.7	10.7	0.74	1.4	0.40	1.0	0.67	0.84	0.51	1.1	0.22	0.38	0.2	0.50	0.20	0.41	0.34	0.47
Low income	4.0	7.5	0.34	0.69	0.21	0.47	0.48	0.71	0.28	0.68	0.28	0.50	0.2	0.50	0.20	0.35	0.44	0.75
Age-standardized mortality rates (per 100,000)																		
High income	168	135	37	30	21	17	16	7.5	14	9.4	4.4	3.9	9.2	7.5	4.7	5.6	2.7	1.6
Upper middle	158	132	29	31	12	14	30	17	6.8	6.6	14	9.2	5.1	5.3	16	7.5	4.4	3.3
Lower middle	98	97	13	13	7.8	9.5	12	7.8	8.4	9.6	4.1	3.5	5.3	5.6	3.6	3.7	5.4	3.9
Low income	120	114	12	12	7.3	8.1	16	12	8.6	10.3	9.2	8.2	9.4	10.2	6.4	5.4	12	10.4
Attributable fractions (% of cancer mortality contributed by modifiable risk factor)																		
Tobacco		26		66		13		17		5		41		6		16		8
Dietary risk		7		4		34		7		3		13						
Alcohol		5				9				5		22				19		
Low physical activity		1				5				1								
High BMI		5				8				6		17				12		
Drug use																14		
Unsafe sex		2																98

Particulate matter (pollution)	4	19
Occupational risk	3	14
Other environmental	1	4

Red colour means an increase between 1990 and 2019; green colour, a decrease.

incidence of different cancers depend on trends in the prevalence of risk factors in populations. Examples include:

- The decrease in tobacco use observed in many countries will lead to a reduction in age-adjusted rates of oral, throat and lung cancers.
- The increase in levels of obesity, together with the increasing consumption of ultraprocessed food, will lead to an increase in age-adjusted rates of colon cancer in many populations.
- Increased vaccination coverage for human papillomavirus (HPV) and hepatitis B virus (HBV) will lead to a decrease in age-standardized incidence of cervical and liver cancers, respectively.

The role of screening programmes is also important. Screening, along with early diagnosis and treatment, has resulted in a 20% decrease in premature mortality from cancer between 2000 and 2015 in HICs, and 5% in LICs.

Interventions at the population level

Table 11.1 shows that around one-half of all cancer deaths could be prevented if modifiable risk factors were eliminated in the whole population (with 36% of all cancer deaths attributable to tobacco and 7% to unhealthy diet). For lung cancer, 66% of deaths are attributable to tobacco use and 19% to air pollution. For cervix cancer, 98% of mortality is attributable to unsafe sex (through HPV infection). These relationships underlie the importance of population-based prevention interventions, which can range from taxing unhealthy products such as tobacco or alcohol to HPV and HBV vaccination. At least 5–10% of all cancers have a strong genetic component.[4] Improved understanding of the genetic causes of cancer is providing new opportunities for cancer prevention (e.g. risk prediction, family counselling) and treatment (e.g. different treatments according to genetic markers) and will continue to do so in future (Chapter 29).

Cancer control programmes

Comprehensive cancer control refers to the broad implementation of ethical and proven measures to actively address the burden of cancer. Approaches should range from prevention, early detection (including early diagnosis and screening) to treatment, palliative care and rehabilitation. This also includes, ideally, a cancer registry and surveillance to strengthen the delivery of services and monitor cancer programmes. Comprehensive cancer control programmes aim to reduce the incidence, morbidity and mortality of cancer and to improve the quality of life of cancer patients. These programmes should engage all levels of the national health system and reach the entire population, from the healthy to those at high risk (e.g. those with a family history) and to patients who are yet to show symptoms, have been diagnosed, are cured or are in the final stages of the disease.[6]

With access to the right treatment, many people with cancer can be cured and/or treated effectively. It is therefore important that countries aim to increase the resources available to cancer control programmes. These programmes should prioritize the early detection of cancers that can be cured through early treatment available in a particular setting and provide palliative/survivorship care for less curable cancers.

Early detection

Early detection of cancer (through clinical presentation, or systematic or opportunistic screening) is important, as is rapid treatment following cancer detection, to maximize the prognosis for the patient. This approach assumes even greater importance in the absence of organized systematic screening programmes targeting the general population.

Organized systematic cancer screening programmes aim to detect early pre-cancer or cancer signs among asymptomatic individuals to reduce cancer incidence and/or outcomes (e.g. case-fatality rates and overall mortality). Such programmes typically target the whole population of a certain age (e.g. screening all women aged 30–49 years with a visual inspection, Pap smear or HPV testing; this is a WHO best buy intervention). These programmes require significant resources, and even in countries with well-run programmes, only 5% of all cancers are detected through screening (the greatest impact being for cervical, breast and colorectal cancers).[4] Screening programmes require high participation rates and quality assurance to be effective. The availability of a test is not sufficient for the establishment of a screening programme (see Chapter 43 on screening and health checks). It is also important to recognize that screening programmes, once initiated, are often very difficult to stop. Many countries therefore pilot their programmes ahead of the full roll-out.

Treatment

Under optimal conditions, many cancers can now be effectively cured or treated in a way that allows many years of productive life. Local and systemic treatment (including a mix of one or several from surgery, radio-, chemo-, hormone- and/or immunotherapy components) can all be effective, but resource constraints may preclude their use in many countries. Rapid advances continue to be made, with up to 40% of all clinical trials in 2020 being in oncology.[4] Robust processes and mechanisms need to be in place to make decisions around if, when and how new treatment should be introduced and sustained (Chapter 45 on medical technologies), and to ensure that once introduced treatment is accessible and affordable for everyone.[7]

Palliative and supportive care

Palliative and supportive care provides for the psychological, social and spiritual needs of the patient and their family, as well as pain relief (including access to opiate analgesia), fatigue, sleep deprivation, cognitive impairment, concerns about relationships and fertility, work and finances, and fear of recurrence issues.[8,9] Patient support groups have the potential to play an important role in supporting people with cancer (Chapter 55).

An integrated approach to cancer services

National cancer control programmes, particularly in low-resource settings, should focus on value for money (i.e. cost-effectiveness and affordability, and not only effectiveness) with the appropriate selection and maintenance of affordable innovative technologies (Chapter 44 and Chapter 45 on access to medicines and medical technologies). An essential package of cancer services can cost only US$ 2–9 per capita in low- and middle-income countries, yet only 40% of national programmes in these countries include cancer in their universal health coverage benefit packages.[10] Diagnosis, treatment and care of people with cancer require investing in well-trained multidisciplinary personnel (including protocols to be in place and being used) as well as the necessary equipment and consumables. Many low- and middle-income countries have an insufficient technical capacity and lack adequately trained staff to deliver a well-functioning cancer control programme.[11]

Patient navigators are an important part of a comprehensive cancer control programme providing assistance to patients through screening, diagnosis, treatment and follow-up. This includes assisting patients in: (i) communicating with healthcare providers; (ii) setting up appointments for medical visits; (iii) getting financial, legal and social support; (iv) liaising with insurance companies and employers; and (v) initiating and/or completing treatment.

Cancer registries

Less than half of all countries report on cause-specific deaths and only a small number of people with cancer are included in high-quality population-based cancer registries. Cancer registries systematically collect, store and manage data on persons who have been diagnosed with and/or treated for cancer.[12] When implemented effectively, cancer registries can be cost-saving institutions.[13] Yet, only one in three countries has high-quality incidence data.

Registries can be categorized as population-based cancer registries (PBCRs) or hospital-based cancer registries (HBCRs). PBCRs focus on a particular geographical area, generating data for epidemiological and public health purposes, including monitoring trends, distribution and priority setting. HBCRs collect data within a particular facility (or several or all hospitals of a region), often using data for administrative, research and educational functions. Findings from PBCRs may have broader generalizability to the whole population but with less detailed data, while findings from HBCRs may have lower generalizability to the whole population (as not all cancer patients access hospitals) but can include more detailed information (e.g. detailed information on treatment, follow-up, etc.).

Frameworks need to be developed that encourage diagnostic and treatment services (both public and private) to share relevant data (e.g. biopsy results, staging, outcomes) while ensuring there are adequate levels of data protection. It is crucial that data are held securely so that healthcare workers can confidently encourage patients to provide informed consent to share personal data so that registries can maximize their potential as a resource for monitoring and evaluating health services, and for research.

Data on both PBCRs and HBCRs should be linked with well-functioning civil mortality registration systems in the entire population (e.g. vital statistics) to obtain reliable information on deaths and causes of death, but this is available in less than half of the world population. Civil registration data for the whole population (including age distribution) are also necessary to produce estimates of cancer frequency at the population level. In addition, cancer registries should be linked to, among others, vaccine and cancer screening registries for maximal utility.

Two of the indicators in the WHO NCD Global Monitoring Framework are dependent on functional cancer registries, allowing for reporting at national, regional and global levels (Chapter 35).

Monitoring

SDG target 3.4.1

A one-third relative reduction in mortality from cardiovascular disease (CVD), cancer, diabetes or chronic respiratory disease by 2030 against a 2015 baseline.

Other relevant WHO NCD Global Monitoring Framework targets and indicators

Target	*Indicator*
As per SDG target 3.4.1.	• Unconditional probability of dying between the ages of 30 and 70 from CVD, cancer, diabetes or chronic respiratory diseases.
An 80% availability of affordable basic technologies and essential medicines, including generics required to treat major NCDs in both public and private facilities.	• Availability and affordability of quality, safe and efficacious essential NCD medicines, including generics, and basic technologies in both public and private facilities.

(*Continued*)

Target	*Indicator*
Additional indicators.	• Access to palliative care assessed by morphine-equivalent consumption of strong opioid analgesics (excluding methadone) per death from cancer. • Availability of cost-effective and affordable vaccines against HPV. • Number of third doses of HBV vaccine administered to infants. • Proportion of women aged 30–49 years screened for cervical cancer at least once and for lower or higher age groups according to national programmes or policies.

Examples of disease-specific targets and indicators are included in the other cancer chapters.

Notes

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2 Global cancer observatory. IARC, 2022.
3 Global health observatory. WHO, 2020.
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