

Cancer control

The negative impact of cancer on individuals and communities can be greatly reduced through cancer control programmes. The scope of cancer control extends from prevention and screening to management of disease, rehabilitation and palliative care. Implementation of cancer control measures requires political will, resource mobilization, and a shared strategy involving governmental and nongovernmental organizations, in particular health services and community and patient groups. This challenge has been addressed by WHO through recommendations for the establishment of National Cancer Control Programmes. They focus particularly on the needs of developing countries and include global perspectives for a successful fight against cancer.



CANCER CONTROL: A GLOBAL OUTLOOK

SUMMARY

- > The aim of cancer control is a reduction in the incidence of the disease and of the associated morbidity and mortality, as well as improved quality of life for cancer patients and their families.
- > Prevention, screening and early diagnosis, treatment and palliative care are the principal approaches to cancer control.
- > Progress in cancer control requires not only sound knowledge of the disease process, but also an understanding of the psychological, social, economic and organizational factors which govern how that knowledge can be put to effective use.

The world cancer burden is expected to increase from the current level of about 10 million new cancer cases diagnosed annually to about 15 million in 2020, largely because of demographic changes and the effects of tobacco, as well as other risk factors. It will take time for cancer control measures, even if efficiently applied and based on well-planned strategies, to have a major impact on these figures. However, prevention could reduce the load by about 2 million by 2020, and 6.5 million by 2040. In contrast, the impact of both screening and treatment is likely to be small; even by 2040, half the potential reduction in cancer deaths from 16 to 8 million would be due to prevention, and much less from more effective screening and treatment. It is clear therefore that, although on a short-term basis we cannot ignore applying effective therapies, for maximum impact on the cancer problem we must change the priority to prevention. The prevention of cancer should be set within the context of prevention of all noncommunicable diseases caused by shared risk factors, while the links between spe-

cific infectious agents and certain cancers will also permit some of the principles of control of communicable diseases to be adopted.

WHO approach to cancer control

The increasing magnitude of noncommunicable diseases, including cancer, represents one of the major health challenges to global development in the new century. To respond to this growing challenge, WHO has given cancer control a high priority in its programme of work and in technical collaboration with countries. WHO has also developed, in close collaboration with its Member States and other partners, a global strategy for the prevention and control of noncommunicable diseases in which cancer control is one of four major priorities. The strategy places emphasis on the rising impact of cancer on developing countries and the disproportionate suffering it causes in poor and disadvantaged populations. The global strategy was endorsed by the 53rd World Health Assembly (May 2000), and in its resolution WHA53.17 the Assembly urges Member States to establish effective national programmes, and requests WHO to provide the necessary technical support and to coordinate global partnerships and alliances for advocacy, capacity building and collaborative research.

WHO is committed to the promotion of National Cancer Control Programmes as the most effective national-level strategy for reducing the morbidity and mortality from cancer and improving quality of life of cancer patients and their families [1]. Medical knowledge is now sufficiently advanced to permit the prevention of at least one-third of all cancers, the cure of a further one-third, given early diagnosis and the administration of effective therapy, and the adequate control of pain and other symptoms, with palliative care for the remainder.

The development of National Cancer Control Programmes is a process which involves the review of the current disease



Fig. 7.1 AIDS information for the general public at a health centre in Côte d'Ivoire. Effective linkages with control programmes for HIV/AIDS and other diseases could facilitate the establishment of effective National Cancer Control Programmes.

and health care situation, evaluation of the potential impact of various disease control strategies (prevention, early diagnosis/screening, treatment and palliative care), the setting of goals and priorities and the allocation of resources. As cancer has increased in incidence in many countries, several have recognized the need to initiate National Cancer Control Programmes. However, others have not yet done so. Because of the increasing importance of noncommunicable diseases, including cancer, in all countries WHO is committed to securing recognition of the importance of cancer among all Member States. This in turn creates further needs, towards which WHO can make important contributions by:

- Updating and disseminating information on effective strategies for cancer prevention and control;
- Developing background documentation on planning National Cancer Control Programmes;
- Working with interested countries in the development and evaluation of their National Cancer Control Programmes;
- Encouraging countries to share experience and learn from successes and failures and promote networking at sub-regional, regional and global levels.

Goals of National Cancer Control Programmes

To reduce the burden of cancer, a country must be prepared to allocate a certain

priority to cancer control activities, and possess a basic public health and health care infrastructure. Prevention of cancer has to be set within the context of prevention of other noncommunicable diseases, as there are a number of risk factors in common. Furthermore, cancer detection and screening and the management of detected cancers (without which screening will fail) have to be set within the existing health infrastructure. No country can afford a cancer care system that is independent of other health care facilities. Such a cancer care system must be capable of covering the total population.

Personnel involved in formulating and implementing the overall strategy should be health professionals with experience in disease control and large-scale health pro-

grammes, together with cancer experts and other health service workers. This will involve collaboration between the relevant Ministry of Health, those in charge of existing cancer programmes, and representatives of appropriate nongovernmental organizations. Ultimately, the Programme should involve the general public, whose knowledge and awareness of the problem can and should become a major force in combating cancer.

Political commitment to the adoption and implementation of these policies is essential. It should be the responsibility of health leaders to convince political leaders, health practitioners and the public of the magnitude of the current and (especially) the future national cancer problem, and to outline what can be done to overcome it. Different objectives and priorities will be

set in different countries, according to the national cancer burden and the resources available. However, the processes to be undertaken in all countries are similar, whether a National Cancer Control Programme is to be introduced for the first time or an existing programme is to be revised to make it more effective.

Components of National Cancer Control Programmes

Matters essential to National Cancer Control Programmes are the subject of chapters in earlier sections of this Report, particularly chapters outlining prevention and management (4 and 6). Such activities are discussed here in relation to difference in impact and priority according to the needs and situations of different communities and countries.

REORGANIZATION OF THE CERVICAL CANCER SCREENING PROGRAMME IN CHILE

In 1985, with the assistance of WHO, a National Cancer Control Programme was established by the Ministry of Health, Chile, with cervical cancer as one of the main priorities. During the previous two decades, opportunistic annual screening for cervical cancer had not achieved the expected benefit. Therefore, in 1987 a public health-oriented cervical screening programme was launched, based on screening women aged 26 to 64 by Pap smear every three years. Health service managers at that time were reluctant to apply the ministry's approach. Consequently the decision was made to focus effort and resources in a demonstration area, the Metropolitan Area of Santiago, which include one-third of the population of the country.

The approach adopted in the Metropolitan Area involved a series of training workshops for health professionals concerned with the programme at every level of care. Each workshop was assisted by a physician expert in education and health com-

munications and aimed at a gradual implementation of the strategies. The participants received motivational input, updated information on the programme and were trained how to assess the current situation, compare it to the desired situation and develop specific strategies to bridge the existing gaps. In a follow-up workshop some months later, evaluation of progress and constraints encountered were discussed and subsequent tasks were planned accordingly. The first strategy implemented was to motivate the female health care providers within the health care system to be screened. The second strategy was to monitor the follow-up of women with abnormal Pap smears in the various levels of care, as they were a key group to track programme deficiencies. Additional strategies involved offering screening to women in the target group from easily accessible and progressively larger female populations.

Seven years later in a consensus meeting, the programme was expanded to cover the whole country. According to biannual national surveys, coverage of the target group by Pap smear had risen from 40% in 1990 to 66% in 1997. The age adjusted mortality rate decreased from 13.3 in 1970 to



Fig. 7.3 Education of women about cervical cancer screening in a primary health care clinic in Chile as part of the regular activities of the centre.

7.7 per 100,000 women in 1999, with an apparently higher rate of reduction in the last five years. The programme emphasized network organization, timeliness of diagnosis and treatment, reliability of Pap smear, and low cost screening promotion strategies at the community level. During the initial years, financial support for the programme was minimal. Additional funding from the government was provided only after six years and this was mainly for upgrading equipment at the secondary level and for supporting community-based, low cost promotion activities.

UICC: A UNIQUE ROLE IN GLOBAL CANCER CONTROL

Founded in 1933, the International Union Against Cancer (Union Internationale Contre le Cancer) plays a critical role in inaugurating and supporting effective cancer control strategies at local, regional, national and international levels. Its objectives are to advance scientific and medical knowledge in research, diagnosis, treatment and prevention of cancer, and to promote all other aspects of the campaign against cancer throughout the world. One of the Union's strengths is the wide spectrum of its membership, being composed of nearly 300 cancer organizations, institutes, societies, associations and Ministries of Health in 85 developed and developing countries.

Core activities

As the only global nongovernmental organization dedicated to cancer control, UICC is uniquely qualified to stimulate and strengthen coordination and collaboration with other concerned organizations and groups, creating a global sense of responsibility. The UICC World Conferences for Voluntary Cancer Organizations, initiated by the UICC Cancer Organizations, Public Education, and Patient Services (COPES) Programme, are one example of such collaboration. COPES is devoted to establishing a worldwide network of voluntary cancer organizations and to providing support to strengthen their services. Another core activity of UICC is the Committee on International Collaborative Activities, which works in collaboration with WHO, IARC and other relevant bodies to stimulate cancer leagues to take an interest in supporting cancer registration and to assist in establishing national cancer control plans and comprehensive cancer centres. In so doing, UICC promotes standardized data collection, better and cheaper services as well as increased survival rates through a comprehensive national health care programme that ranges from patient information to palliative care for the entire population.

Emphasis on prevention and reduction of disparities

The strategies recently set up by UICC for the new century call for a greater emphasis on public health, prevention, risk reduction, information awareness campaigns and carefully selected screening programmes. As lung cancer is the world's leading preventable cause of death, UICC's focus is to curb tobacco use by promoting comprehensive tobacco control programmes and providing technical assistance and advocacy training for cancer leagues and institutions in developing countries seeking to fight the use of tobacco products. Building the capacity of nongovernmental organizations and cancer leagues and catalysing the optimal use of current knowledge are other goals of UICC, in order to reduce existing disparities in cancer prevention and care. In many parts of the world, cancer patients are diagnosed at an advanced stage and do not have access to early detection or screening for early-stage cancer. UICC facilitates the education of health professionals with a focus on common cancers that have an easily applicable medical intervention (cervical, breast, colorectal cancers etc.). The Union has the means, through its membership, to become a clearing house and conduit for lifesaving cancer interventions, by promulgating the transfer of clinical and programme techniques from places that already have them to places that do not.

Sharing knowledge

UICC Fellowships and world standard publications such as the *International Journal of Cancer*, the *TNM Classification of Malignant Tumours* (Sobin L and Wittekind C, 5th edition, John Wiley & Sons, New York, 1997) and the *Manual of Clinical Oncology* (R. Pollock et al., 7th edition, John Wiley & Sons, New York, 1999) all make UICC a reference point and a resource in the dissemination of knowledge about cancer and its application to patient care.

Through its Information Network (<http://www.uicc.org>), and by supporting and strengthening local access to the Internet, the Union contributes to making information uniformly applicable and available

across the world. An example of a free Internet-based service is the UICC Telepathology Consultation Centre, which helps pathologists around the world to get a second opinion in difficult tumour cases. Information dissemination is also effected via meetings, workshops and symposia. The UICC Quadrennial Cancer Congress is instrumental in improving uniform standards in cancer care by providing a digest of state-of-the-art in all cancer disciplines while attracting attention to challenges in developing countries.

Voluntarism

An integral part of UICC, voluntarism constitutes a way for organizations to achieve maximum effectiveness when they want to reach deep into the community. An objective of UICC is to teach institutions and leagues how to recruit, train, motivate and manage volunteers, and to be a proponent worldwide for voluntarism by creating a global awareness campaign through its members.

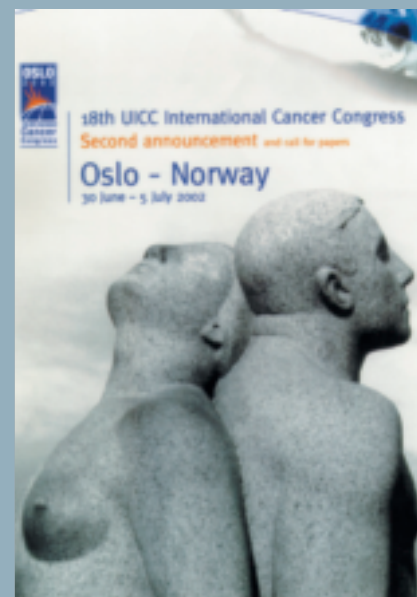


Fig. 7.4 Poster advertising the UICC International Cancer Congress, 2002.

Prevention of cancer

Every country should give high priority to tobacco control in its fight against cancer. Unchecked, smoking will cause more than 10 million deaths from cancer (predominantly lung cancer) in the next decade [2]. Given the multi-faceted impact of diet on cancer, in many countries the aim must be to encourage consumption of locally produced vegetables, fruit and agricultural products, and avoid the adoption of Western style dietary habits. Dietary and alcohol policies and measures to increase physical exercise and reduce obesity should be developed in a local context [3].

Since other common noncommunicable diseases share the same lifestyle-related risk factors, action to prevent cancer should focus on controlling these risk factors in an integrated manner. This requires close coordination with programmes for the prevention of other related noncommunicable diseases, mainly cardiovascular diseases, chronic obstructive pulmonary diseases and diabetes. The structure and mechanisms necessary to ensure such collaboration will vary from one country to another according to the epidemiological situation, disease control priorities, available resources and existing initiatives. In some countries, a national structure within the Ministry of Health charged with health promotion and disease prevention is given the responsibility of planning, implementing and evaluating primary prevention initiatives in close coordination with - and active contribution by - the National Cancer Control Programme as well as other noncommunicable disease prevention programmes. Continuing surveillance of levels and patterns of risk factors is of fundamental importance to planning and evaluating primary prevention activities.

There is a great need for effective and carefully evaluated school education programmes for tobacco abstinence and healthy dietary habits. Very few countries have such education programmes that are effective [2]. National Cancer Control Programmes can help to ensure that governments take the necessary actions to guarantee that the public has

the motivation to adopt healthy personal habits.

In some countries, steps may be needed to avoid exposure to known carcinogens in industries transferred from developed countries. Prevention of infectious disease is relevant. Hepatitis B vaccination should be included to prevent future cancers of the liver in many countries. Strengthening *Schistosomiasis* control programmes is the most feasible approach to reduce the incidence of bladder cancer in certain countries.

Early detection of cancer – early diagnosis and population screening

The strategy of early diagnosis is a public and health professional awareness activity. A public health education campaign teaches people to recognize early signs of the disease and urges them to seek prompt medical attention. Health professionals, especially primary health workers, are trained to identify cases that are suspicious and refer them for rapid diagnosis.

Because of the considerable resources involved, population screening programmes should be undertaken as a component of early detection only where their effectiveness has been demonstrated, where resources (personnel, equipment, etc.) are sufficient to cover at least 70% of the target group, where facilities exist for confirming diagnoses and for treatment and follow-up of those with abnormal results, and where prevalence of the disease is high enough to justify the effort and costs of screening. At present, population screening can only be advocated widely for cancer of the cervix by Pap smear; such screening should be done in all developed countries and in those developing countries where it is feasible. Population screening for breast cancer by mammography should only be considered in countries with high rates of breast cancer and that can afford the high technology cost, and which have the skilled professionals required, due to the much lower effectiveness of breast screening [4]. In such programmes, efforts should concentrate on women at greatest risk of developing invasive can-



Fig. 7.2 Training of a cancer registry clerk in Khon Khaen, Thailand. Population-based cancer registries or vital statistics systems are necessary to assess changes in incidence and mortality.

cer, i.e. those aged 30 and over for cervical cancer and those aged 50-69 for breast cancer.

Treatment of cancer

A National Cancer Control Programme should establish guidelines for integrating treatment resources with programmes for screening and early diagnosis, and provide therapeutic standards for the most important cancers in the country.

The efficacy of treatment varies depending on cancer type, and this should influence priorities. Some treatments require sophisticated technology that is available only in locations with substantial resources. Since the cost of establishing and maintaining such facilities is high, it is desirable that they should remain concentrated in relatively few places in a country to avoid draining resources that could be devoted to other aspects of the National Cancer Control Programme.

WHO has established an essential drug list for oncology, based on generically available drugs that enable those cancers with a high priority for therapy to be treated in most countries [5]. WHO supports the introduction of radiotherapy based largely on cobalt units in appropriate centres. In all countries, measures must be taken to ensure access to therapy for those patients with treatable cancers, and ensure that adequate standards of care are followed.

WHO TOBACCO FREE INITIATIVE

The Tobacco Free Initiative is a WHO cabinet project created to focus international attention, resources and action on the global tobacco pandemic that kills more than four million people every year. It is estimated that tobacco will kill 10 million people a year by 2030 and that over 70% of these deaths will occur in the developing world.

Globalization of marketing and trade in tobacco products means that all countries need to take strong action individually and together if their populations are to become free of the burden of tobacco-related disease and death. WHO has initiated work on the Framework Convention on Tobacco Control - the world's first set of multilaterally negotiated rules focusing on global tobacco control. Currently being negotiated by 191 countries, the treaty will be ready for ratification no later than 2003. This new legal instrument will address issues as diverse as tobacco advertising and promotion, agricultural diversification, tobacco product regulation, smuggling, excise tax levels, treatment of tobacco dependence, second-hand smoke and tobacco free areas.

The challenge comes in seeking global and national solutions in tandem for a problem that cuts across national boundaries, cultures, societies and socioeconomic strata. The Framework Convention on Tobacco Control process seeks to activate all those areas of governance that have a direct impact on public health.

Science and economics will mesh with legislation and litigation. Health ministers will work with their counterparts in finance, trade, labour, agriculture and social affairs ministries to give public health the place it deserves.

The Framework Convention on Tobacco Control process also involves building up the national capacities of countries to undertake tobacco control activities. This includes technical assistance on legislation but extends to many other areas. In collaboration with the World Bank, the Tobacco Free Initiative has been looking into the issue of the economics of tobacco control. The work demonstrates that the economic fears that have deterred policymakers from taking action are largely unfounded. Policies that reduce the demand for tobacco, such as a decision to increase tobacco taxes, would not cause long-term job losses in the vast majority of countries. Nor would higher tobacco taxes reduce tax revenues; rather, revenues would climb in the medium term. Such policies could, in sum, bring unprecedented health benefits without harming economies.

Some of the projects that the Tobacco Free Initiative is involved in extend to surveillance. In collaboration with the USA Centers for Disease Control and Prevention, the Global Youth Tobacco Survey has been implemented in over 50 countries. The Global Health Professionals Tobacco Survey monitors tobacco use, assesses behaviours in providing cessation support to patients and assesses knowledge of health effects of tobacco. Advocacy for policy change is the cornerstone of the Tobacco



Fig. 7.5 Poster for Tobacco Free Sports, World No Tobacco Day 2002.

Free Initiative's communications and information work. "Tobacco Kills - Don't be Duped", a two-year United Nations Foundation-sponsored project on media and nongovernmental organization advocacy for policy change, was launched in 1999 and is being piloted in over 25 countries. World No Tobacco Day, May 31st, focuses on different themes every year. The theme for 2002 was Tobacco Free Sports. The United States Centers for Disease Control and Prevention, the International Olympic Committee, the Federation Internationale de Football Association (FIFA), Olympic Aid and other regional and local sports organizations joined WHO in this campaign. Tobacco free events organized all over the world included the 2002 Salt Lake City Winter Olympic Games in the USA and the 2002 FIFA World Cup in the Republic of Korea and Japan.

These and other areas of work all have a single purpose - to cut back on tobacco consumption and to save lives.

Palliative care

Since palliative care services can be provided relatively simply and inexpensively, they should be available in every country. Palliative care should be given high priority, especially in countries where the majority of patients are diagnosed with cancer at an advanced stage and cure for most of them is likely to remain impossible for

years to come. Health care providers should be trained to deliver palliative care, both within health care facilities and in patients' homes. Guidelines for the relief of cancer pain have been drawn up by and are available from WHO; the widespread availability of morphine for oral administration is critical to pain relief, and should be ensured by appropriate legislation [6,9].

Managing the development of a National Cancer Control Programme

Although countries differ in their preparedness to initiate national cancer control programmes, all, even the most technologically advanced, have to set priorities and decide how best to allocate the available resources. This requires several carefully-managed steps, which include:

- Assessing the magnitude of the cancer problem, i.e. performing a situation analysis
- Determining priorities and setting measurable cancer control objectives
- Evaluating possible strategies for cancer control
- Appointing a National Cancer Control Programmes coordinator
- Performing a policy review to ensure that appropriate decisions are made
- Formulating an action plan with measurable monitoring and evaluation indicators
- Mobilizing (and reallocating) necessary resources.

The initial situation analysis is essential for understanding the magnitude of the cancer problem and for setting priorities and reallocating resources. This is based on:

- demographic (population) data
- data on cancer morbidity, incidence and mortality
- data on other diseases
- information on health care facilities and human resources.

Role of cancer registries in National Cancer Control Programmes

Cancer registries can contribute to surveillance by:

- Assessing the current magnitude of the cancer burden and its likely future evolution
- Providing a basis for research on cancer causes and prevention
- Providing information on prevalence and trends in risk factors
- Monitoring the effects of early detection/screening, treatment, and palliative care.

Cancer registries can also provide a focus of epidemiological expertise with the responsibility of providing data on a continuing basis on incidence, prevalence, mortality, methods of diagnosis, stage distribution, treatment patterns and survival. In planning a Programme, a critical step is to obtain political commitment from the government. Perhaps equally important is to ensure the availability of leadership by a nationally respected and knowledge-

able individual with good management skills. The cancer policy provides the framework for a balanced cancer control programme, defining broad aims, principles, objectives, their relative priority and indicating the resources and programmes required to carry out the policy. Priorities for the Programme are determined by the local situation, epidemiological trends and the existence of cost-effective interventions. Among locally prevalent cancers, those that are preventable and those that are amenable to early detection and treatment should be identified. Resources must be allocated accordingly and should be provided by the government and supplemented by nongovernmental organizations and, if necessary, by special fund-raising. A key issue is the reallocation of resources from unproductive areas to areas with greater potential for success. A classic example is high frequency of cervical cytology screening of young, and therefore low-risk, women versus low intensity screening of older,

THE CANCER CONTROL PROGRAMME OF KERALA, INDIA

The National Cancer Control Programme of India was formulated in 1984, focusing on (a) primary prevention of tobacco-related cancers, as 50% of all cancer in India was due to tobacco use, (b) early detection of cancers at accessible sites, as the three major forms of cancer were accessible (cancer of the cervix, breast and oral cavity) (c) augmentation of treatment facilities, and (d) establishment of equitable pain control and a palliative care network throughout the country, as more than 80% of cancer patients presented at a very late stage. Kerala, a state in south-western India with a population of 31 million, was the first state in the Indian union to formulate a state-wide cancer control programme, and did so in 1988 as a 10-year action plan. The state programme was prepared with the same goals as the National Cancer Control Programme of India and was developed with advice from WHO. The

programme consisted of creation of awareness of risk factors and early warning signals. This empowers the population to seek healthy lifestyles and examinations supported by medical procedures to detect and diagnose the disease in early stages and receive treatment in institutions designed for this purpose.

Tobacco control included two state-wide programmes targeted at teenagers via the school system. A programme carried out in 1993-4 "One Lakh Tobacco Free Homes" resulted in 126,000 homes being declared tobacco-free. During the past two years, a similar programme has been implemented in over 6,000 schools. With respect to early detection, as high technology, expensive methods were beyond the means of this state, the programme stressed education followed by diagnosis. Awareness via opportunistic early detection clinics was organized with the support of the government and voluntary organizations. Self-examination methods were emphasized, particularly for cancers of the oral cavity and breast. Over 12,600 village

level cancer control volunteers were trained to promote awareness of cancer and detect early signs of disease, to advocate and motivate people to undergo diagnostic screening tests and therapy, and to extend financial support. This activity covered 85 villages in the state. Early Cancer Detection Centres were developed to serve as focal points for coordination and implementation of early detection programmes in the state. Emphasis was given to the improvement of therapy hand-in-hand with the improvement of early cancer detection. In addition, two nodal centres for pain control and palliative care have been set up in the State and 16 peripheral centres are networked under the guidance of these main centres. Morphine tablets have been available since 1991 and the local manufacture of morphine tablets has begun. Upon evaluation, this programme has achieved a reduction in tobacco consumption, downstaging of advanced tumours, augmentation of comprehensive therapy programmes and networking of palliative care centres.

CANCER CONTROL IN THE USA: CENTERS FOR DISEASE, CONTROL AND PREVENTION

One of the focuses of the Centers for Disease Control and Prevention (CDC) is developing, implementing, supporting and evaluating cancer prevention and control efforts in the USA.

CDC's many activities related to cancer include the following: cancer registries, cancer risk and behavioural surveillance systems, tobacco control, comprehensive cancer control and occupational, environmental and infectious disease-related cancers. CDC's educational initiatives and interventions include those for breast, cervical, colorectal, prostate, skin, and ovarian cancers, for infectious-disease related cancers (e.g. hepatitis C-related liver cancer and *Helicobacter pylori*-related stomach cancer) and tobacco-related cancers (e.g. lung and oral cancers). Recognizing the importance of physical activity and nutrition in preventing disease, including cancer, CDC also has programmes in physical activity and nutrition.

Developing and strengthening cancer surveillance systems

Cancer registry data are used to identify and monitor cancer trends, gaps, disparities, barriers and successes, to develop and guide state-wide, comprehensive cancer prevention and control plans, to prioritize allocation of resources, to serve as the basis for research, and to evaluate prevention and control efforts. Such data are, therefore, the foundation upon which all cancer prevention and control efforts should be based.

Many countries, including the USA, need to establish, support or strengthen an integrated, nationwide cancer surveillance system and use the system's data as a basis for decision making. In a step towards development of such a system in the USA, CDC launched the National Program of Cancer Registries Cancer Surveillance System (NPCR-CSS) in January 2001. The system will receive, assess, enhance, aggregate and share data from the National Program of Cancer Registries-funded programmes. Established

in 1992, the National Program of Cancer Registries supports registries in 45 states, 3 territories, and the District of Columbia. The goal of the NPCR-CSS is to maximize the benefits of state- and territory-based cancer registries by providing feedback for improving data quality and usefulness and to provide public-use data for regional and national studies.

Once cancer registries are established, decision- and policymakers should support and strengthen them in the following ways:

- Provide adequate funding and staffing to ensure that registries are fully equipped and that their personnel are adequately trained so as to provide complete, timely, accurate data, obtain certification of data and conduct research.
- If needed, develop, enact, and implement legislation and regulations that strengthen and support registries.
- Ensure that the data are certified as meeting standards for completeness, timeliness, and quality.
- Encourage integration of cancer registry data with those of other relevant data systems, such as geographic information or behaviour and risk factor surveillance systems. Linked data may provide more clues to risk factors for cancer, how to prevent cancer and how to increase survival and improve the health care delivery system.
- Use registry data to develop and review policies and programmes, develop and update comprehensive cancer control plans, allocate scarce resources and evaluate the effectiveness of actions taken.

Preventing tobacco use

Use of tobacco products is the single most preventable cause of disease (including cancer) and death, yet tobacco use remains a problem worldwide. In 1999, CDC launched the National Tobacco Control Program. The programme provides funds to all 50 states, the District of Columbia, and USA territories to conduct tobacco control activities. It has the following goals:

- Eliminate exposure to environmental tobacco smoke.
- Prevent initiation of tobacco use among young people.

- Promote quitting of tobacco use among adults and young people.
- Eliminate disparities in tobacco use among various populations.

The programme's goals are being achieved through four components: community interventions, anti-tobacco marketing in the media, policy and regulation, and surveillance and evaluation.

For tobacco control programmes to succeed, decision-makers and policymakers need to provide leadership, support research evaluating tobacco control efforts, and support training of health care professionals. CDC has developed and disseminates *Best Practices for Comprehensive Tobacco Control Programs* (<http://www.cdc.gov/tobacco/bestprac.htm>).

A new approach: comprehensive cancer control.

Globally, cancer control activities are fragmented, uncoordinated and often categorized and funded by cancer type. In the USA, CDC has been supporting development of an integrated approach called comprehensive cancer control. This includes surveillance, policy, research, education and intervention programmes, services, and evaluation. By integrating these activities and services, health agencies, policymakers and others can better prioritize, maximize use of limited resources, reduce duplication of or unnecessary efforts, evaluate and improve the effectiveness of all actions. The approach also aims to increase cooperation and collaboration among risk-factor and cancer-specific programmes and activities (including surveillance systems).

CDC and its partners have developed a comprehensive cancer control framework (<http://www.cdc.gov/cancer/ncccp/cccpdf/09Abed67-78.pdf>) that will help states and other entities address major cancers, establish priorities and apply limited resources. CDC currently is providing USA states, territories and tribes with guidance and, in some cases, funding to develop and implement comprehensive cancer control programmes.

high-risk women. Further details on planning are provided in the National Cancer Control Programmes handbook [1].

Achievements of effective National Cancer Control Programmes

National Cancer Control Programmes permit a better use of available funds, ensure a sound scientific basis to programme components, and promote social justice by ensuring equitable coverage of the population. Development of a Programme following an internationally accepted framework results in an understanding of the broader issues by both health care professionals and the general public. Of particular importance in many countries are avoiding the misuse of available resources, both public and personal, and an ethical obligation to relieve suffering at reasonable costs.

Barriers to effective National Cancer Control Programmes

There are a number of potential barriers to an effective Programme. These may include competing interests that could prevent the resources intended for cancer control being allocated to this purpose. In addition, the future patient is unknown and under-represented, so the importance of prevention may be down-

graded as there is a lack of knowledge on the potential for prevention, both among health professionals and the public. Further, in both early detection and therapy, there tends to be excess reliance on high technology, with a failure to recognize the potential for contribution from low technology approaches. In the palliative care area, although the principles have been carefully set out by WHO, there may be a failure to ensure the availability of oral morphine, and also a failure to ensure that morphine is prescribed correctly, both in hospital and in home care. Other major barriers include:

- Lack of essential drugs and minimum standards of health care in low-income countries and disadvantaged populations
- Lack of appropriate human resources
- Lack of effective linkages with control programmes of other diseases (other noncommunicable diseases, HIV/AIDS, reproductive health etc.)
- Lack of effective intersectoral approaches necessary for primary prevention
- Insufficient involvement of the community and nongovernmental organizations.

Monitoring impact of cancer control

As part of Programme planning, mechanisms must be set up to monitor the impact of cancer control activities. In

general, this is best centred on a population-based cancer registry and an established vital statistics system. However, it is possible to set up ad hoc mechanisms, especially if the programme is initially concentrating on a few cancer sites. The basic measures are:

- Trends in cancer incidence - to assess the impact of prevention (and screening for those cancers detected in the precursor stage, especially cervical)
- Trends in cancer mortality - to assess the impact of screening and treatment
- Change in tumour stage - to assess the impact of early detection
- Change in cancer survival - to assess the impact of treatment.

These should be supplemented by process measures, such as reduction in the prevalence of smoking in adults, and take-up of smoking in children and adolescents, measurement of the proportion of the target population receiving screening, and the proportion of patients with curable cancers receiving therapy, and the proportion of those with non-curable cancers receiving oral morphine. Process measures can be applied in all countries. In countries without population-based cancer registries or vital statistics systems, it will be impossible to assess changes in incidence and mortality.

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WEBSITE

The WHO Programme on Cancer Control:
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CANCER CONTROL IN DEVELOPING COUNTRIES

SUMMARY

- > More than 50% of the world's cancer burden, in terms of number of cases and deaths, occurs in developing countries.
- > Some developing countries, particularly in Asia and South America (e.g. China, India, Thailand, Brazil, Peru, Costa Rica), have established effective diagnosis and treatment facilities, but such progress has been severely limited in many regions of Africa.
- > Primary prevention measures targeting the most common cancers prevalent in the region, should be a mandatory component of National Cancer Control Programmes.
- > Since a large proportion of cancer in developing countries is only detected late in the course of disease, efforts to achieve earlier diagnosis through improved awareness and diagnosis are warranted. Delivery of adequate palliative care and pain relief are equally important.

More than half of the global cancer burden is experienced in developing countries, although incidence rates in such countries are low compared to those in developed countries [1-3]. This burden of disease necessitates rational planning and appropriate investment in prevention and early detection. There is an equal requirement for the evolution of basic health services in a phased manner, taking due account of available technical and financial resources, which are often limited in developing countries.

A review of the current status of cancer control across the world reveals a widely varying level of progress in respect of primary prevention activities, early detection initiatives, and cancer-related health care including infrastructure and human resources. While the developed countries of Europe, North

America, Australia and Japan have organized, sophisticated health care systems for cancer control, very little has been achieved in this domain in many sub-Saharan African countries, where even basic requirements for delivering minimal cancer care are lacking. On the other hand, certain countries in Asia (e.g. China, India, Israel, Iran, Jordan, Oman, Philippines, Viet Nam, Thailand, Singapore) and South America (e.g. Argentina, Brazil, Bolivia, Peru, Costa Rica, Cuba) have been successful in establishing and furthering basic facilities for diagnosis and treatment of cancer in at least some regions within these respective countries. This certainly provides a foundation for further expansion of cancer control activities.

Cancer information systems

Information systems providing data on cancer incidence (population-based cancer registries) and survival, as well as mortality (death registration) are useful for a reliable situation analysis and formulation of cancer control strategies. Incidence and mortality data are valuable for monitoring and evaluating the effectiveness of cancer control measures. Such data, while not totally lacking, are far from comprehensive (Table 7.1). The establishment of population-based cancer registries in developing countries has been a very haphazard process. Some countries have an official policy to support cancer registries, but in most developing countries with cancer registries, this outcome has followed a localized initiative of research-oriented clinicians and pathologists.

As indicated by the International Association of Cancer Registries listing, (<http://www.iacr.com.fr/iacrweb.htm>), 131 population cancer registries exist in 65 developing countries in Africa, Latin America and Asia. Some of them cover national populations (e.g. Israel, Oman, Costa Rica), while most are confined to certain regions or capital cities. The reliability and completeness of data reported from these registries are variable. Incidence data pertaining to 34 populations in 21 developing countries were reported in volume VII of *Cancer Incidence in Five*



Fig. 7.6 A tribesman from a rural area of West Java, Indonesia, wearing a sweatshirt sponsored by a tobacco company. Smoking prevalence in men in this area has been reported to be 84%.

M. Imperi (2000) *Brit. Med J*, 321, cover photo, with permission from the BMJ Publishing Group.

Continents [4] while volume VIII will be reporting on 57 populations in 22 countries. Population-based cancer survival data, which reflect the average prognosis for a given cancer, and hence are indicative of the efficiency of cancer health services in a particular region, are available for only 11 populations in 6 developing countries [5,6].

In contrast, cancer mortality data from only 10 Asian countries, 8 countries in South America and the Caribbean and a single country in the African continent were reported to the WHO Cancer Mortality Data Bank in or around 1995. In certain instances, these data covered the countries only partially. It is quite likely that many of these existing mortality registration systems are incomplete to varying degrees in terms of their ability to capture all deaths and relevant information on cause of death. Limited relative frequency information (which may provide a restricted and biased insight on cancer patterns in a given region) obtained from hospital cancer registries or medical records departments is available from some developing countries lacking reliable incidence data. However, medical

records departments are either rudimentary or do not exist in many sub-Saharan African countries and are poorly developed in many countries in Asia.

The importance of establishing and maintaining information systems, particularly population-based cancer registries, to support and evaluate cancer control programmes is clear. The organization of population-based cancer registries covering selected regions with particular cancer health services seems to be the most feasible approach in the short term. Much more sustained and coordinated efforts are required to develop a reliable mortality registration system for the entire country. The evolution of a network of cancer registries under the National Cancer Registry Programme of India provides a good example.

Primary prevention efforts

There are no dedicated and sustained primary prevention programmes for cancer in many developing countries. However, there is wide recognition that efforts should be made to create awareness at the community level. Thus individuals may be encouraged to adopt healthy lifestyles, based on informed choice, as a means to control common cancers. There has been very little focus in developing countries on educational initiatives concerned with cancer prevention, such as tobacco control, guidelines on diet and alcohol consumption, avoidance of exposure to certain infections, promotion of physical activity and so on. Thus far, health education

for cancer has been largely the outcome of periodic, sporadic activities by cancer societies or cancer treatment establishments.

The implementation of fiscal measures, such as taxation, impacting upon tobacco and alcohol control, is the responsibility of Finance Ministries in many countries. Such decisions may be influenced by revenue considerations, commercial and agricultural pressures, and least of all, by public health concerns and advocacy. Pricing policies for tobacco and alcohol are important factors influencing consumption, and are relevant to cancer prevention. To a large extent, pricing may have contributed to preventing large increases in the consumption of processed tobacco products such as cigarettes in many sub-Saharan African countries and in the Indian subcontinent. Long-term policies to provide alternative agricultural and commercial employment for those previously involved in tobacco production, marketing and sales have so far received very little attention in those countries where the tobacco industry is a major contributor to the economy.

Legislative measures may impinge on advertising, health warnings, sales and consumption of tobacco products and alcohol, as well as reducing occupational exposure to hazardous substances. Often, there is no lack of enactment of such legislation by governments. However, very little attention has been paid to the means of implementing these measures by the various agencies concerned with their enforcement. In fact, exist-



Fig. 7.7 Women participating in WHO cervical cancer screening in Ambillikai, South India (supported by the Bill and Melinda Gates Foundation).



Fig. 7.8 The medicine cupboard in a health care centre in Burkina Faso. Resources are scarce and essential medicines are often in short supply.

ing legislative measures often remain to be implemented or enforced in many countries, sometimes for want of better awareness, willingness and coordination among different agencies.

Though some 31 high and intermediate-risk developing countries have implemented hep-

Regions	Number of countries with data available for the 1990s		
	Incidence data published ¹	Population-based cancer survival ²	Mortality data ³
Africa (56 countries)	8	None	1
Central and South America (21 countries)	6	None	5
Caribbean (8 countries)	3	1	2
Asia (44 countries)	13	5	7

¹ Based on *Cancer Incidence in Five Continents*, Volume VIII, peer-reviewed papers and registry reports.

² References [5, 6]

³ WHO Cancer Mortality Database (as available on <http://www-depdb.iarc.fr/who/menu.htm>)

Table 7.1 Availability of cancer incidence, survival and mortality data from South America, Africa and Asia.

Regions	Number of countries providing cancer control services ¹		
	Pathology services	Screening programmes	Radiotherapy
Africa (56 countries)	49	None	20
Central and South America (21 countries)	21	5	16
Caribbean (8 countries)	8	1	5
Asia (44 countries)	43	1	32

¹ R. Sankaranarayanan, communication based on personal observation.

Table 7.2 Diagnostic and radiotherapy facilities in developing countries.

atitis B vaccination as part of an immunization programme, coverage needs to be further improved. In sub-Saharan Africa, where there is a high risk of HBV infection, only four countries have so far implemented HBV vaccination. Lack of adequate financial resources is a major impediment to the adoption of HBV vaccination in many high-risk developing countries.

Referral, detection, treatment and care facilities

A cancer control programme cannot be developed and be functional in a country without a network of laboratories and hospitals providing basic diagnostic and treatment facilities for cancer patients. Nor can a cancer control programme work without a framework for appropriate referral practices across the three levels of care, namely primary, secondary and tertiary. In developing countries where such basic facilities exist (e.g. Algeria, Argentina, Brazil, China, Costa Rica, Cuba, Egypt, India, Jordan, Kenya, South Korea, Philippines, Singapore, South Africa, Thailand, Tunisia, Viet Nam, Zimbabwe, etc.), diagnostic and treatment services have been mostly established in the tertiary care sector.

Diagnosis and early detection

The minimum diagnostic facilities required for cancer detection include histopathology, basic imaging services (here restricted to conventional diagnostic radiology and ultrasonography), and basic endoscopy. These will contribute to diagnosis and to assessing

the clinical extent of disease, as well as indicating therapeutic options and prognosis. The basic clinical resources include surgical services for radical excision of tumours, radiotherapy and chemotherapy to the extent of providing selected essential drugs for adjuvant or mainstay treatment.

Early detection may be achieved through screening, case-finding and health education [7]. Many developing countries do not have sustained and focused activity directed towards early detection in their health services. Screening requires a committed infrastructure and is cost-intensive. It is not feasible to introduce screening programmes in many developing countries due to technical and financial constraints. A few South American countries, such as Brazil, Chile, Cuba, Costa Rica, Mexico and Colombia, and Singapore in Asia, have introduced cervical cancer screening with cytology, variously covering either national or selected urban populations [8]. However, most of these programmes have not been associated with reductions in incidence and mortality. Cuba has introduced an oral cancer screening programme, which again is yet to be associated with a reduction in incidence or mortality from oral cancer [9]. Singapore and Cuba have limited breast cancer early detection facilities in their health services.

Review of the availability of diagnostic and treatment services in developing countries (Table 7.2) indicates that the level of such services is particularly poor in sub-Saharan Africa, where there are extremely limited

facilities for histopathology. Most countries in the region have a single pathology laboratory with one or two pathologists. Only in six countries are there more than two histopathology services and more than four pathologists in the entire country. In most countries, the laboratories are equipped with old, malfunctioning equipment and staffed by two or less locally trained technicians, with no quality control procedures of any sort. There are no continuing education/re-orientation opportunities available for these personnel.

In many sub-Saharan African countries, other facilities like conventional diagnostic radiology (let alone computerized imaging systems), ultrasonography and endoscopy are available only to a very limited extent in the public health services. If these are available at all, they are not within the reach of most people as they are located in the capitals and require out-of-pocket payments.

Surgery

Surgery plays an important role in the diagnosis and treatment of cancer generally. Removal of the tumour mass is curative for many localized solid cancers. Facilities for simple diagnostic and therapeutic surgery are available in the district hospitals of many countries in Asia and Latin America and facilities for more radical surgical procedures are offered in university hospitals and other tertiary care centres in these countries. A large number of trained surgeons are also available.

THE INTERNATIONAL AGENCY FOR RESEARCH ON CANCER: CANCER RESEARCH FOR CANCER CONTROL

The International Agency for Research on Cancer (IARC, <http://www.iarc.fr>) is part of the World Health Organization. IARC's mission is to coordinate and conduct research on the causes of human cancer and the mechanisms of carcinogenesis, and to develop scientific strategies for cancer control. The Agency is involved in both epidemiological and laboratory research and disseminates scientific information through publications, meetings, courses and fellowships. The Agency's work has four main objectives.

Monitoring global cancer occurrence

IARC is studying cancer incidence, mortality and survival in numerous countries and is thus playing a leading role in cancer registration worldwide. IARC supports and coordinates cancer registries throughout the world, being involved in initial advice and planning, the provision of training and the production of training manuals, guides and computer software, as well as in the collection and analysis of data. The Agency provides the secretariat for the International Association of Cancer Registries (which links registries in over 100 countries) and for the European Network of Cancer Registries. Collaboration is most active with developing countries, often including field studies to identify the causes of cancer that are important locally. Data from cancer registries throughout the world are published regularly in the *Cancer Incidence in Five Continents Series* and the *GLOBOCAN* and *EUCAN* databases which are also produced in electronic format (<http://www.dep.iarc.fr>).

Identifying the causes of cancer

Since the Agency's creation, a strong emphasis has been put on cancer etiology.

In laboratory investigations, epidemiological studies and working group meetings, more than 800 agents and exposures have been examined with the aim of unambiguously identifying those which cause cancer in humans. IARC's prestigious series of *Monographs on the Evaluation of Carcinogenic Risks to Humans* (<http://monographs.iarc.fr/>) are authoritative reports on risks posed by these agents and exposures. Recent Monographs have included *Man-made Vitreous Fibres*, *Non-ionizing Radiation Part 1*, *Some Thyrotropic Agents* and *Some Industrial Chemicals*.

Elucidation of the mechanisms of carcinogenesis

IARC laboratory research concentrates on the interaction of carcinogens with DNA, with the aim of elucidating mechanisms of carcinogenesis. Particular emphasis is placed on identifying carcinogen-induced, endogenous and inherited mutations in transforming tumour suppressor genes. For example, IARC maintains the p53 Mutation Database, which contains over 16,000 published mutations in the *p53* tumour suppressor gene (<http://www.iarc.fr/p53/>). This knowledge not only gives insights into the biology of cancer, but also helps to identify stages where it may be possible to intervene to prevent progression to clinical disease. IARC has research collaborations with scientists and with research and public health institutions in over 60 countries.

Developing scientific strategies for cancer control

IARC's programmes are aimed at finding approaches to preventing cancer. This includes both primary prevention and early detection of cancers. The role of IARC among cancer research institutes is characterized by its focus on cancer prevention, by its emphasis on studies that combine epidemiological and laboratory approaches, and by the special

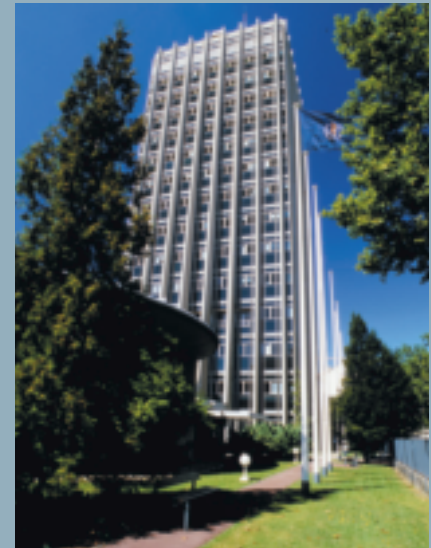


Fig. 7.10 The International Agency for Research on Cancer in Lyon, France.

forum and support it provides for international collaborations. In 1996, IARC established a programme to evaluate cancer prevention strategies, the results of which are published as the *IARC Handbooks of Cancer Prevention*. The first volumes in this series deal primarily with chemoprevention of cancer, e.g. *Retinoids*, *Sunscreens*, whilst subsequent titles include *Weight Control and Physical Activity* and *Breast Cancer Screening*. Although the implementation of measures to control cancer is not a central part of its mission, the Agency takes part in interventions with the aim of testing their effectiveness in preventing cancers or in the early diagnosis of tumours. For example, the Gambia Hepatitis Intervention Study, conducted in The Gambia, is designed to assess the effectiveness of vaccination of newborn infants against hepatitis B virus in preventing cancer and other diseases of the liver. The Agency is not as a rule involved with research into cancer treatments.

Treatment facilities are not widely available in most of sub-Saharan Africa. Surgical services are very limited, with only a few departments (e.g. general surgery, gynaecology, orthopaedics, urology etc.)

attached to university hospitals providing limited services as part of their overall services for a variety of diseases, and then for paying patients only. The surgical services available are often limited to abdominal and

pelvic surgical procedures, mastectomy, excision of superficially located tumours and biopsy procedures. Committed surgical oncology services catering for the needs of cancer patients are available only

CANCER CONTROL IN A RURAL DISTRICT IN WESTERN INDIA

The Tata Memorial Centre, Mumbai, India, is the apex body for cancer control in Western India and one of the major Comprehensive Cancer Centres in India. It has encouraged the initiative of a voluntary body called Ashwini Rural Cancer Research and Relief Society in cancer control in an industrially and educationally backward rural region of western India. The Society wished to organize a rural Comprehensive Cancer Centre in Barshi town in Solapur District, Maharashtra, to provide multidisciplinary services encompassing cancer prevention, early detection, treatment, pain relief and continuing care to the rural poor as well as to conduct community-oriented cancer control research. Thus the Nargis Dutt Memorial Cancer Hospital was set up in 1982. The Tata Memorial Centre, under the aegis of its rural cancer extension project, provided continuing technical assistance to organize and develop the clinical and community extension services of this hospital.

A basic cancer surgical facility with an outpatient clinic and an operating theatre was first organized while the Tata Memorial Centre trained two surgeons in the principles and practice of surgical oncology, as well as other medical and paramedical personnel. A health education programme was initiated in the rural districts surrounding the hospital to create cancer awareness. Soon a histopathology and a cytology laboratory were established followed by endoscopy and radiological facilities. Ultrasound equipment was added in 1987. Thus basic diagnostic and surgical facilities were organized initially along with community awareness programmes.

A population-based cancer registry to monitor cancer incidence in part of the rural district (Barshi, Paranda, Bhum Tehsils) served by the hospital was established in 1987 with assistance from the Indian Council of Medical Research. This

started providing reliable cancer incidence data from rural India for the first time. The results from the registry revealed that cervical cancer was responsible for half of the cancer burden in women. Meanwhile the cancer awareness efforts culminated in an increasing proportion of women with cervical cancers diagnosed in earlier clinical stages as years passed.

A radiotherapy facility with a Theratron Phoenix telecobalt unit, brachytherapy equipment, a treatment planning system and a radiation physics laboratory was initiated in 1992 with assistance from Ratan Tata Trust in Mumbai. A committed medical oncology service was inaugurated in 1995. A CT scanner was added in 1999. The technical staff for these facilities were trained by the Tata Memorial Centre.

The Nargis Dutt Hospital initiated a non-randomized controlled intervention study in 1995 to evaluate the outcome of focused health education on the early detection of uterine cervical cancer, in collaboration with IARC. This initiative, now in its sixth year, has resulted in early detection and increased survival, followed by a non-significant reduction in death from cervical cancer in the district receiving health education as compared to the control district.

The Hospital has now grown into a Comprehensive Cancer Centre with 80 inpatient beds and a patient dormitory, catering for the cancer care needs of approximately 8 million people living in the surrounding districts of Solapur, Osmanabad, Latur, Ahmed Nagar, Beed and Aurangabad in Maharashtra state, Western India. The institution is headed by a chairman and is staffed by two surgical oncologists, a radiation oncologist, a physician, two anaesthetists, a pathologist, three resident medical officers, an epidemiologist, two pathology/cytology technicians, three laboratory technicians, a physicist, three radiographers, twelve oncology nurses and some health workers. Around 1,400 new cancer patients are registered annually, and around 6,000 follow-up visits are carried out. The



Fig. 7.11 The Nargis Dutt Memorial Cancer Hospital, Barshi.

laboratories process around 1,700 specimens for histology, and around 4,000 radiological imaging procedures are carried out annually. Around 400 major and 550 minor cancer surgical procedures and around 400 endoscopic procedures are carried out annually. Around 700 patients receive radiotherapy and 500 receive some form of chemotherapy.

In 1999, the Nargis Dutt Hospital initiated a randomized intervention trial involving 160,000 women to evaluate the comparative efficacy and cost-effectiveness of cervical screening approaches such as visual inspection with acetic acid, low intensity cervical cytology, and HPV testing in cervical cancer prevention in collaboration with the Tata Memorial Centre and IARC.

The Nargis Dutt Hospital has grown into a major community cancer centre providing comprehensive cancer control services, encompassing detection, treatment and prevention services, to a large rural population in Central India. The programmes are financially sustained by the revenue generated by the Hospital, non-recurring government grants, research grants and voluntary donations. Services are provided free of charge or subsidized for approximately half of the registered patients. The rural cancer control model developed by the Tata Memorial Centre and the Nargis Dutt Hospital is ideal for replication in many low resource settings.

in the capitals/urban areas of four sub-Saharan African countries.

Radiotherapy

Radiotherapy services are capital-intensive requiring considerable outlay for equipment, buildings and other infrastructure, as well as for trained personnel. Proper maintenance and calibration of equipment are essential to ensure sustained delivery of good quality, safe treatment. It has been shown that the acquisition of these services is related to the per capita gross national income of countries, with some regional variations. The cost of initiating (average cost of a cobalt unit is US\$ 500,000 and a linear accelerator costs US\$ 1.2 million) and sustaining radiotherapy services, the lack of trained personnel (radiotherapists, radiation physicists and technicians) and the necessity of having allied oncology services (diagnosis, pathology and surgery), in a sound hospital environment have been major factors limiting the provision of adequate radiotherapy services in most developing countries, particularly in sub-Saharan Africa.

In spite of significant expansion of radiotherapy services in the last decade, there is a major discrepancy in the availability of radiotherapy equipment between developing and developed countries [10,11]. For instance, Italy has more machines (200) than the whole of Africa (155). Currently, a total of 2,233 mega-voltage machines (671 linear accelerators and 1,562 cobalt machines) are available in developing countries, to serve a population of 5.5 billion people [12]. In contrast, 4,472 machines (3,902 linear accelerators and 670 cobalt machines) are available in developed countries, to serve a population of 1.5 billion people.

As with other areas of cancer control, Africa is the least developed region in terms of available radiotherapy services [10]. A total of 155 radiotherapy machines are available in Africa, accounting for 7% of machines in the developing world. These are located in 23 of the 56 African countries, and Egypt, South Africa, Algeria, Tunisia, Morocco and Libya account for 80% of these (125 machines). At any given time, a proportion of the radiotherapy facilities in the 16 sub-Saharan countries, other than South Africa, may not be functioning due to equipment breakdown or lack of radi-

ation source or lack of trained personnel.

Many countries have inadequate or non-existent radiotherapy services. The rapid acquisition of comprehensive radiotherapy services is an unrealistic goal if there are limited technical and financial resources. It may be more prudent for some countries, particularly sub-Saharan countries, to form consortia to organize good quality, sustainable radiotherapy services in selected locations, which can thus be shared and subsidized by neighbouring countries.

Indigenous production of cheap and robust radiotherapeutic equipment and radioactive sources is important in the context of setting up radiotherapy services in developing countries. Countries like Brazil, China and India have established some capabilities in this domain.

Chemotherapy

A WHO consultation has proposed a list of 24 essential cancer chemotherapeutic drugs: ideally 17 drugs should be available for the treatment of the 10 most common cancers and 8 others should be available only where the resources and facilities exist for the treatment of paediatric cancers and leukaemias [13]. These drugs are not widely available in most sub-Saharan African countries and in some Asian and South American countries. Where available, these drugs are not subsidized, and hence not within the reach of many needy cancer patients. Expensive drugs subject to import duties, together with the limited efficacy of these agents in the context of most disseminated cancers, are major impediments to the gradual development of cancer chemotherapy in health services. It is impossible and unrealistic to subsidize cancer chemotherapeutic drugs in view of the extremely limited total health care resources available for cancer control in developing countries. Indigenous production of these drugs will go a long way in decreasing the costs of cancer chemotherapy. Currently, only a few developing countries, such as Brazil, China, Cuba, India, South Korea and South Africa, produce a sufficiently wide range of cancer chemotherapeutic drugs to have a great impact on costs. Basic facilities for diagnosis and chemotherapy are available in the tertiary care centres in most other developing



Fig. 7.9 A technician at a microtome, preparing histological slides in Luanda, Angola. Pathology laboratories are limited in many regions of sub-Saharan Africa.

countries in Asia and South America. However, these are often restricted to urban centres, causing accessibility problems for rural populations.

Comprehensive care

Comprehensive Cancer Centres, providing preventive, diagnostic, therapeutic, supportive and follow-up cancer care under one roof, are an important and effective organizational level in the delivery of cancer care, and are usually tertiary care centres. In most developed countries, cancer care is predominantly delivered through such centres established in different regions to cater for a defined population catchment area. Establishment and maintenance of Comprehensive Cancer Centres require considerable financial and technical resources. These Centres serve as apex bodies for cancer control in large regions, if sufficient attention is paid to incorporating extension services such as preventive oncology, community participation, palliative care (particularly in the home), and continuing follow-up care. In fact, some of the best models of cancer control activities in developing countries have been built around regional Comprehensive Cancer Centres, which have developed and directly implemented regional cancer control programmes (e.g. India, Thailand, Viet Nam, Peru). Such Centres are being increasingly developed in health services in Asia and Latin America, whereas there are few in Africa. More than 70% of the patients diagnosed

CANCER CONTROL IN GUINEA, WEST AFRICA

Guinea is situated on the Atlantic coast of West Africa and has an area of 246,000 km². The estimated population was around 7.5 million in 1999, with an annual growth rate of 3%. The crude death rate is around 14 per 1,000 and the infant mortality rate around 134 per 1,000. Guinea has a fairly well developed primary health care system, but all health services levy charges.

A population-based cancer registry was organized in 1990 to register incident cancer cases among the residents of Conakry, the capital. The registry reported an overall average annual rate of 83.3 per 100,000 males and 110.5 per 100,000 females, during 1992-1994. The common cancers in males were liver (age-standardized rate per 100,000 population 32.6), prostate (8.1 per 100,000 population) and stomach (6.2 per 100,000 population); the predominant cancers in females were cervix (46.0 per 100,000 population), liver (12.5 per 100,000 population) and breast (10.9 per 100,000 population). Only a quarter of the registered cancers were microscopically verified.

The department of pathology at the University Hospital of Donka, Conakry, is the only histopathology service in the entire country. This is staffed by a Guinean pathologist trained in France and a locally trained laboratory technician. This laboratory processes around 800 pathology specimens annually. Basic materials such as alcohol, formalin,

stains and paraffin are always in short supply. The laboratory is equipped with an old but functioning microtome, a binocular microscope, a histiokinette and other materials, which are mostly donated from abroad.

The University Hospital of Donka and the Central Hospital of Ignace Deen in Conakry, the capital of Guinea, provide most of the cancer diagnostic and treatment services in Guinea, though some limited surgery is possible in a few provincial hospitals. Conventional radiology, ultrasonography and endoscopy services are available in these hospitals. Clinically inoperable cases are not usually subjected to biopsy. Cancer treatment is mostly limited to surgery for early cervix, breast, ovarian and stomach cancers and other operable superficial cancers. There are no thoracic or neurosurgical facilities. A medical oncology/haematology oncology service has been recently organized in the University Hospital of Donka, staffed by a physician. A restricted spectrum of cancer chemotherapeutic drugs is available from this service on payment. There is no radiotherapy service available in Guinea. If patients can afford it, they are referred to Senegal or France for such treatment. In practical terms, very little can be offered for inoperable tumours. Charges are levied for all services in the public health care services in Guinea. There is some coordination and collaboration between the histopathology, surgery, gynaecology and medical oncology services in these two hospitals.

A state-of-the-art private hospital with advanced medical, surgical and imaging



Fig. 7.12 The University Hospital of Donka, Conakry.



Fig. 7.13 Women awaiting screening for cervical cancer at the University Hospital of Donka, Conakry.

facilities mostly serves expatriates and affluent Guineans who can afford the services.

There is no officially proclaimed national cancer control programme in Guinea. HBV vaccination is not part of the immunization protocol in Guinea. A limited experimental intervention to reduce exposure to aflatoxins has been organized in a small region near Kindia. There are no early detection programmes for cervical cancer. A formal evaluation of visual inspection with acetic acid for early detection of cervical dysplasia and their treatment with cryotherapy is ongoing in collaboration with IARC.

with cancer in sub-Saharan Africa do not receive or complete the prescribed treatment. In regions of Asia and Latin America, the proportion of newly diagnosed cancer patients not receiving, or not completing, prescribed treatment ranges from 20% to 40%. Comparative studies of cancer survival in 11 developing country populations indicate that the average five-year survival associated with cancers such as

colon and rectum, larynx, breast, cervix, ovary, urinary bladder, kidney, testis, lymphoma and leukaemia are 10-25 years behind those in the USA, Western Europe and Japan [5,6].

Consensus policies on approaches to diagnosis, treatment and palliative care of cancer on a site by site basis for major cancers, taking into account the resources available, are important in

developing cancer control programmes and may prove extremely useful in optimizing use of resources. Such policies are generally lacking in most developing countries.

Palliative care

A large proportion of cancers in developing countries are diagnosed at advanced stage and thus palliative care merits a major place

in the overall cancer strategy. WHO has catalyzed a major awareness and orientation of palliative care and this initiative has resulted in substantial improvements in the delivery of care [14-16]. Homecare concepts have gained currency. The "three-step analgesic ladder" approach and the availability of oral morphine for pain relief have significantly advanced palliative care. However, progress has not been uniform throughout the world, particularly in comparison to more developed countries. Thus even now, cancer pain remains unrelieved in a significantly large proportion of cancer patients, particularly in sub-Saharan Africa, mostly due to inadequacy or non-availability of opioid analgesics, particularly oral morphine.

Human resource development

The existing human resources for cancer control (oncologists, pathologists, epidemiologists, oncology nurses, technicians, administrative personnel) are limited in many developing countries, particularly in sub-Saharan Africa, certain countries of the Middle East

and in some developing countries in Asia and Latin America. For instance, in the whole of francophone sub-Saharan Africa, there are not more than sixteen pathologists, four trained radiation oncologists and six medical oncologists. Similarly, there are only a small number of technicians trained in laboratory technology, radiology technology etc. There are only nine countries sub-Saharan Africa where regular training programmes exist for personnel concerned with aspects of cancer control. Generally, inadequacy of training of personnel is an impediment in developing countries.

Conclusion

A strict appraisal of the current situation in each developing country would allow a realistic review of resources available and their allocation for cancer control. The theory and practice of cancer control should be addressed in relation to specific needs: primary prevention, early detection, therapy, pain and symptom relief, psycho-social rehabilitation and health

services development [17]. In the context of several competing health care priorities in low resource settings, the goal of having a National Cancer Control Programme, as advocated by WHO, to establish priorities, must be evaluated pragmatically. A National Cancer Control Programme provides a framework for rational and integrated implementation of cancer control activities taking into account the facilities already existing, and focusing on vertical investment to augment the necessary health care services. Introducing basic diagnostic services, basic cancer surgical facilities and palliative care should be the initial goals for implementing cancer programmes where current development is poor. Once achieved, this should form the nucleus for future expansion into other areas including prevention, diagnosis, treatment and continuing care, as well as information services. Investment in more capital-intensive areas should follow the establishment of basic services.

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WEBSITES

- CANCER*Mondial*:
<http://www-dep.iarc.fr/>
- International Association of Cancer Registries:
<http://www.iacr.com.fr/>
- Directory of ongoing research in cancer prevention:
<http://www-dep.iarc.fr/prevent.htm>
- ENCR (European Network of Cancer Registries):
<http://www-dep.iarc.fr/encr.htm>

PERSPECTIVES AND PRIORITIES

SUMMARY

- > Current smoking levels and the adoption of unhealthy lifestyles, together with a steadily increasing proportion of elderly people in the world, will result in a doubling of new cancer cases, from 10 million worldwide in 2000 to 20 million in 2020, with an annual death toll then reaching 12 million.
- > Strategies exist to reduce the predictable burden of cancer through research, education, prevention, early detection, treatment and palliative care. Political will and international collaboration are now required for effective cancer control.
- > Application of existing knowledge, technology and control strategies could prevent at least a quarter of all cancer cases, and cure at least a third of all cancer cases in the next 20 years.

Thanks to social and economic advances that the world has witnessed during the late 20th century, humanity is facing rapid change and many challenges. During the last five decades, food supply has more than doubled and increased much faster than population growth; per capita gross domestic product in real terms has risen by at least two and a half times, and adult literacy by more than 50% since 1970. Dramatic increases have been observed in the number and proportion of children at school and the proportion of chronically undernourished children has declined considerably. These changes are having a major impact on global disease patterns and on the health and quality of life of human beings. Without question, the face of humanity is being rapidly reshaped due to political, economic and sociocultural interaction; the world of 2050 will be radically different from today's and will be almost unrecognizable from that of 1950.

Population health is no exception to this dynamic evolution, with global changes influencing and conditioning the way individuals and communities live, work and age.

Increasing life expectancy and population ageing

Globally, life expectancy at birth has increased from 45 years in 1950 to 66 years in 2000 and is expected to reach about 77 years in 2050 [1,2]. By 2025, the majority of countries, covering about 96% of total world population, will have a life expectancy at birth of greater than 60 years; for no country will it be less than 50 years (Fig. 7.14). The global population is expected to increase by 60% during the next 50 years, from 6 billion people in 2000 to 9.4 billion people in 2050; the number of people aged 60 years and above will more than triple, from 610 million to 1.9 billion, during this period.

With a slow and steady decline in fertility rates, the population of the world is thus ageing rapidly. The median age of the global population will have risen from 23.5 years in 1950 to 36.5 years in 2050. The global proportion of the population aged 60 years and over will increase from 10% in 2000 to more than 20% in 2050. The most rapid increase is, however, expected among the number of "oldest-old" - those aged 80 years and over. This population will increase by a factor of five between 2000 and 2050. The number of centenarians is increasing at an accelerating rate. In France, for example, the estimated number of centenarians was about 200 in 1950, and 8,500 in 2000, and will reach 150,000 by 2050. The life span of many individuals extends beyond the age of 115 in some countries.

In the early 1950s, the great majority of the global population died before the age of 50; today, the great majority is dying after the age of 50. It has been estimated that among 100 persons aged 20 years in 1955, at least 60 will be able to celebrate their 65th birthday and that among 100

persons aged 20 years in 1995, at least 80 persons will have that privilege. This represents an increase of more than 30% in survival chances between the two generations and has been achieved through advances in medicine and public health, in science and technology and above all in the adaptation and application of medicoscientific knowledge for the improvement of health for all. These advances offer real hope for a longer, and hopefully a healthier future for humankind [3].

While extending life expectancy is desirable in itself, it is equally important that increased expectancy is accompanied by freedom from any prospect of years of suffering as a consequence of chronic diseases, pain or disability. Individuals are becoming conscious about their health expectancy, defined as life expectancy in good health. Unfortunately, while much is known about the determinants of population health in terms of life expectancy, very little is known about human longevity - the maximum duration of an individual's life and its determinants.

Cancer trends and prognosis

WHO reported that in 2000 [4] there were more than 6 million deaths caused by cancer, i.e. about 12% of a total of more than 55 million deaths from all causes worldwide. Infectious and parasitic diseases accounted for about 26% and diseases of the circulation for about 30% of total deaths. During the period 1985-1997, the number of deaths from cancer is estimated to have increased by 35%, from 4.5 million deaths in 1985 to 6.1 million deaths in 1997 [5] (Fig. 7.17). Deaths from circulatory diseases increased by about 30%, from 11.5 million to 15.1 million. These increases were not, however, geographically uniform. From 1985 to 1997, in more developed countries, there was a slight decline in the number of deaths due to circulatory diseases, but an increase of about 9% in the number of deaths due to cancer. During the same period, in developing countries the number of deaths increased

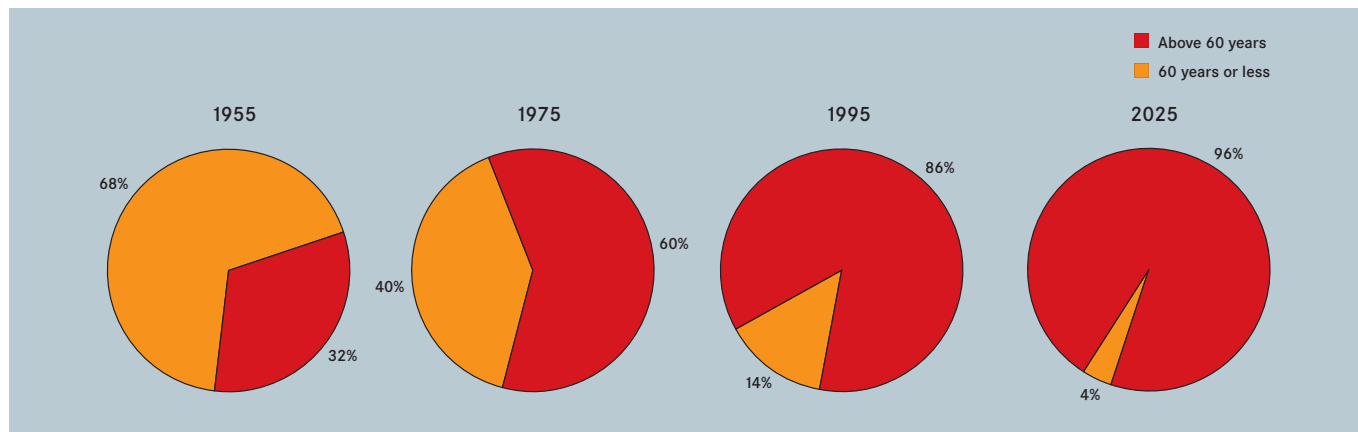


Fig. 7.14 Worldwide life expectancy at birth is steadily increasing. It is estimated that by 2025, approximately 90% of the total population of all WHO Member States (representing >90% of the global population) will live for 60 years or more. WHO World Health Report, 1998.

by at least 62% both for circulatory diseases and for cancers.

In 2000, there were 6.2 million cancer deaths, 10.1 million new cases of cancer and 22.4 million persons living with cancer worldwide [6]. This represents a global increase of about 22% in cancer deaths and in cancer incidence during the period 1990-2000. By 2020, the number of new cancer cases is expected to reach at least 15 million a year and cancer deaths 10 million a year. WHO in 1998 [5] reported that in 1960 cancer was one of the five leading health problems in three of the six WHO regions (The Americas, Europe and Western Pacific). Moreover, it will be one of the top five leading health problems by 2025 in all the WHO regions, except for the Africa region. Cancer is emerging as a major problem globally, both in more developed and in less developed countries.

Priority areas for action

Opportunities are clear at national and international levels for initiatives to control and reduce incidence, mortality and avoidable suffering and pain due to cancer. With a better understanding of the causes, mechanisms and progression of cancer, vigorous implementation of proven interventions, systematic experimentation and evidence-based choice of efficient delivery procedures, it is possible to reduce the burden of cancer.

WHO (1998) [5] concludes that by taking

effective action now, cancer incidence can be reduced substantially. Even modest efforts to adapt and apply available treatments, early detection methods and healthy lifestyle approaches will have far-reaching effects on the cancer burden worldwide. Achieving these goals is predicated on a commitment to coordinate global and national priorities for research, development and implementation of cancer control strategies. It requires a broad focus. In addition to providing evidence-based, cost-effective clinical interventions targeting selected cancer sites in individual patients, the task is to deliver essential yet comprehensive evidence-based, cost-effective medical and health interventions covering prevention, diagnosis and treatment. To achieve cancer control, a cost-efficient approach is required in order to deliver programmes as a part of the existing health systems infrastructure (see: *Cancer control package and its delivery*, p323). In some instances, different measures may be appropriate for the developed and the developing world, but many aspects of prevention and treatment are relevant to almost all communities.

Prevention

From a global perspective, cancer prevention can be justifiably focused on three cancer-causing factors: tobacco, diet and infection. These factors are responsible for at least 4.6 million cancer deaths (73%)

and 7.5 million new cancer cases (75%) annually, and for at least 15.8 million persons living with cancer (72%) in 2000 [8]. Effective promotion of a healthy diet, smoking avoidance/cessation and safe sex may be complemented with improved access to prophylactic and preventive vaccination and appropriate screening for high-risk populations.

Infection is responsible for about 17% of cancer incidence worldwide (varying from about 7% in developed countries to about 25% in developing countries) [9]. Present knowledge offers means by which transmission of infectious agents, such as hepatitis B virus (HBV) and *Helicobacter pylori*, can be reduced. Preventive HBV vaccination is already available worldwide and prophylactic vaccination against hepatitis C virus (HCV) and human papillomaviruses (HPV) may be introduced in the near future. The infrastructure for existing immunization services at national and international levels could be utilized in this context.

Early detection

Early detection can lead to a rapid and complete return to health. Established methods of screening, whether technology-based or undertaken by direct inspection, have reduced the mortality of cervical cancer. HPV testing, when combined with a conventional cervical smear test, improves the identification of cancerous

ETHICS AND CANCER

Major ethical issues are inherent in almost all aspects of cancer control: primary prevention, screening and early diagnosis, treatment and terminal care. The design and management of research involving human subjects, including clinical trials, also generate important ethical questions.

Ethical problems arise in a clinical, public health or research context when choosing between alternative decisions and may entail a conflict between different values, each regarded as intrinsically "good". The first, indispensable step in ethical decision analysis is to recognize the existence of a potential ethical conflict beyond what may appear as a mere technical choice. For example, the physician's assessment of the positive and negative consequences of a cancer treatment (physical, psychological and social) may differ from that of the patient and this divergence must be fully taken into account. A current approach for the recognition and analysis of ethical problems is to view decisions in the light of three moral principles: autonomy, beneficence and justice. Autonomy dictates that personal choices by competent persons should not be constrained. Beneficence (and, prior to this, non-maleficence, "*first, do no harm*"), dictates that the decision should benefit the recipients. Justice implies that every subject should be treated equally. Ethical problems arise because these principles very often conflict when applied to specific situations. Thus, offering a patient the widest scope of therapeutic resources, consistent with beneficence, may deprive others of resources, contrary to the principle of justice. A working scheme for ethical decision analysis involves examining choices in the light of the three principles as relevant to each of the parties affected, e.g. the patient, the physician, the relatives and the scientific community. Although some moral philosophers regard this procedure as inadequate, given the complex and unique nature of ethical conflict situations, the scheme has become a popular tool within biomedical ethics committees.

Ethical problems arise in *primary prevention* influencing personal behaviour, granted the impact of tobacco smoking, alcohol drinking, diet and sexual habits upon cancer. Individual behaviour should result from personal informed choices rather than being the product of psychological pressure, however well intentioned. However, respect for autonomy as well as beneficence converge in justifying vigorous anti-tobacco initiatives.

In *secondary prevention*, the central ethical issues revolve around the level of benefit which warrants offering a screening procedure to healthy, asymptomatic individuals. Positive evidence of some benefit should be available, ideally in terms of reduced death rates. Those participating should be informed of relevant risks in a clear, balanced way. Screening for genetic predisposition to cancer in the general population is not yet feasible but genetic testing for some cancers in high-risk families is established. Multiple ethical questions remain unanswered. For instance, should a young woman at risk of familial breast cancer consent to a test to determine whether she possesses a *BRCA 1* mutation, and if so, at what age? What could be the effects of a positive test on her life, marriage and child-bearing? Will recognition that she is at risk materially improve her situation? Moreover, the investigator may be involved, if testing results in awareness of the genetic status of family members who have not provided any consent.

Ethical problems in *cancer treatment* centre upon the need for more effective, safe therapies. Controlled randomized trials are necessary to ensure unbiased comparison of treatments. However, assigning patients on a random basis to the new or the old (best standard) treatment continues to raise legitimate concerns. The implicit hope when propounding a new treatment is that it is more effective than the standard one: it may be regarded as unethical not to offer such a hope to every patient. Such limitations can only be overcome by extensive discussion with the proposed participants, explaining the rationale of the investigation and the degree of hope and, at the same time, uncertainty that

surrounds the alternative treatments and justifies randomization. Without this process, consent signed by a patient is not informed and is ethically unsatisfactory. Appropriate dialogue, information and communication can reduce the likelihood of patients and families relying to their detriment on untested but highly publicized treatments, and perhaps abandoning effective, if uncomfortable, therapy.

Prevailing ethical attitudes, and consequent legal dispositions, vary worldwide with respect to active interventions to terminate life for compassionate reasons. Such options are not legally available in most countries. An exception is Holland where, provided strict rules are followed to ascertain the patient's wishes, these interventions are not regarded as legally punishable, the ultimate evaluation being left to the judicial authority. There is scant evidence that cancer patients faced with a poor prognosis, when given adequate support and care, seek life-ending interventions. Hence appropriate palliative care, guaranteeing the highest possible quality of life to the patient and to those close to him or her, is currently regarded from an ethical perspective as the most acceptable course of action.

To conclude, first, there cannot be an ethically justifiable decision without informed participation of all individuals affected by the decision, however demanding this may be. Second, ethics committees, composed of representatives of all parties involved in decision-making, are essential for the protection of the individual. The terms of reference, guiding principles and operational procedures of these committees should be accessible to the community at large. Third, a continuous and critical self-scrutiny is required from all involved in order to focus on the substance of the ethical issues and quash the notion that ethical responsibility is discharged by the filling-in of a multiplicity of forms.



Fig. 7.15 A grandfather at work in his vegetable garden, Columbia, an example of an active, healthy lifestyle at advanced age.

abnormalities [10] but it is not yet known if this results in improved outcomes. The process of technical innovation continues to produce increasingly sophisticated, but easily adaptable, early detection techniques. A major cost in instituting any cancer screening programme is that associated with informing the community and sustaining logistics to cope adequately with initial positive findings. Education plays a critical role in motivating and increasing access to cancer screening.

Treatment

Based on the growing knowledge of the mechanisms underlying cancer, new drugs are being developed and the efficacy of new drug combinations is being assessed. Novel drugs will not necessarily eradicate tumours but, when used in combination with other agents, may turn many cases of rapidly fatal cancer into “manageable” chronic illness [11]. The potential worldwide health gain from defined interventions in cancer treatment using chemotherapy (including hormone therapy) has been assessed [8]. Seventeen drugs target those cancers which collectively account for 13.3 million (60%) persons living with cancer worldwide and 3.9 million (around 62%) annual cancer deaths. All these drugs

are also widely available as generic preparations at relatively low cost. It is also operationally feasible to give these drugs in an outpatient setting rather than in a hospital ward.

Many hospitals dealing with cancer patients are now establishing nurse-led day chemotherapy suites, as it is increasingly acknowledged that chemotherapy can be given in a day-care setting if the outcome of therapy is realistically defined and laboratory facilities are available to monitor basic markers (such as blood count, and liver and renal functions). Also required are implementation of clear protocols adapted to local circumstances which nevertheless meet scientifically demonstrable criteria, and rigid adherence to these protocols. A curable-cancer programme based on an essential drug list with a delivery system that meets the above attributes of good patient care and with a mechanism to monitor availability and performance of its components should improve efficiency and quality of cancer care worldwide.

Palliation

Individuals suffering from cancer form a burden that goes beyond the statistics of mortality and incidence, a burden that is borne by patients, their entire family and the community. In developed countries, roughly 50% of cancer patients die of the disease; in the developing world, around 80% of cancer patients have late-stage incurable disease when they are diagnosed. Clearly, the health profession has an ethical duty to prevent avoidable suffering at least through palliative care for pain relief. When cure is not possible, suitable measures to alleviate pain in terminal illness through effective palliative care are essential. Recent studies in the USA, Canada and Latin America concluded that the primary barrier to patient access to palliative care is lack of education for patients, as well as for health professionals. The situation is amenable to intervention through education and involvement of patients and their families in the provision of palliative care. Well-integrated community-based programmes that enable patients to die with dignity in a situation of their choice are achievable as a part of cancer control strategy.

The cancer control package and its delivery

In order to achieve an overall decline in cancer burden at national and international levels by reducing cancer incidence, improving cancer survival outcomes and ensuring pain control, WHO has formulated strategies that focus on education, prevention, early detection, treatment and palliative care. At the core of this cancer control strategy, there will be an essential package of cost-effective interventions for at least the following components: tobacco control, infection control, healthy eating, a curable cancer programme and palliative care. Once modalities for cancer prevention, screening and diagnosis, and treatment are chosen, it is necessary to integrate them into a comprehensive “cancer control package” that can be applied in countries at various levels of development. Provision must be made for its delivery as an integral part of the health services infrastructure. This package should include a technical protocol and operational guidelines for a cost-efficient approach to providing appropriate services to patients and the general population. Thus, a comprehensive approach may start with relevant anticancer medical interventions targeting specific types of cancers, but should evolve into a cancer control package that incorporates prevention, diagnosis, treatment and care, and takes account of genetic diversity between individuals as well as environmental and lifestyle information [7].



Fig. 7.16 Advances in many areas of medicine and public health will ensure a longer and healthier life span for today's children.

IMPACT OF THE HUMAN GENOME PROJECT

The Human Genome Project was initiated in 1990 in the United States by the National Human Genome Research Institute at the National Institutes of Health and the US Department of Energy. The Project is an international research effort defined by a series of specific goals (Collins FS et al., *Science*, 282:682-689, 1998) of which the major ones are: (1) to build genetic maps constructed by classical Mendelian studies of families or populations; (2) to build physical maps, constructed by analysis of the anatomic location of genes along the chromosomes; and ultimately (3) to determine the DNA sequence of the approximately 3×10^9 base pairs that constitute the human genome. Centres around the USA and Europe, as well as Japan and China, are involved in this effort. The expected completion date of the finished product, without any gaps or ambiguities, is 2003, although an initial sequence and analysis has already been published (*Nature*, <http://www.nature.com/genomics/human/>; *Science*, <http://www.sciencemag.org/feature/data/genomes/landmark.shl>; <http://www.hugo-international.org/hugo/>). Progress can be monitored at the website <http://www.ncbi.nlm.nih.gov/genome/seq>, where genetic information is available in the public database GenBank.

Sequencing data obtained highlight the extreme similarity of human beings at the DNA level (99.9%). Cataloguing the 0.1% of human genetic variation is a key goal, as the data will provide information about increased susceptibility or resistance to disease. Identifying single nucleotide polymorphisms (SNPs), which are DNA sequence variations, should permit the performance of association studies that compare affected and non-affected individuals, and the specification of the genetic component of complex diseases such as cancer (Collins FS, Mansoura MK, *Cancer*, 91: 221-225, 2001). A specific programme has been started to identify SNPs in 450

samples from fully informed consenting individuals from Africa, Asia, Europe, and the Americas before colonization. These case-control studies will focus on correlation or associations between specific SNPs and diseases, and in most cases, data generated will be relevant to many populations. For example, African-American men are 32% more likely to develop prostate cancer than Caucasian men. Initially conducted on Caucasian populations, previous studies on the genetic contribution to prostate cancer have identified regions of chromosome 1 and chromosome X that are likely to harbour variations in genes that lead to increased susceptibility (Gronberg H et al., *Cancer Res*, 57: 4707-4709, 1997; Xu J et al., *Nat Genet*, 20: 175-179, 1998). A project involving the National Human Genome Research Institute, Howard University and the National Institutes of Health has recently been set up and preliminary data suggest that regions of the genome other than those previously identified might be involved in susceptibility to the disease in African-American men.

The sequencing data produced by the Human Genome Project may provide a mine of information about new genes having a role in different cancers. Revealing the complexity of cancer at the genomic level will require comparison between "normal" cell and cancer cell genomes. Moreover, new technology will be required to address the diverse kinds of genetic changes that are present in cancer cells (Futreal PA et al., *Nature*, 409, 850-852, 2001). One example is the development of gene expression profiling using cDNA microarrays (e.g. Khan J et al., *Nat Med*, 7: 673-679, 2001). Identifying associations between specific SNPs, as well as other genetic changes, and cancer will help to predict increased risk, to provide early detection, and to promote more effective treatment strategies. However, with the potential for this research to dramatically improve human health, a number of complex ethical, legal, and social issues arise. They are addressed in a specific programme established as an integral part of the Human Genome Project. Its major priorities



Fig. 7.18 Automatic DNA sequencing at the Sanger Centre, Cambridge, UK.

are to guarantee health insurance and employability for individuals known to be at genetic risk, and privacy of health data records.

WHO has recently published a guide which covers biological, social and ethical aspects of the recent advances in genome research and their potential benefits for human health (*Genomics and World Health*, World Health Organization, Geneva, 2002).

Websites:

The Cancer Genome Project, UK:
<http://www.wellcome.ac.uk/en/1/bioevncan.html>

Cancer Genome Anatomy Project, USA:
<http://cgap.nci.nih.gov/>

The National Human Genome Research Institute, USA:
<http://www.nhgri.nih.gov/>

Functional genomics: the Human Genome (*Science*):
<http://www.sciencemag.org/feature/plus/sfg/human/timeline.shtml>

Genome Web—lists of genome sites:
<http://www.hgmp.mrc.ac.uk/GenomeWeb/>

The Human Genome: a guide to information resources online (NCBI):
<http://www.ncbi.nlm.nih.gov/genome/guide/human/>

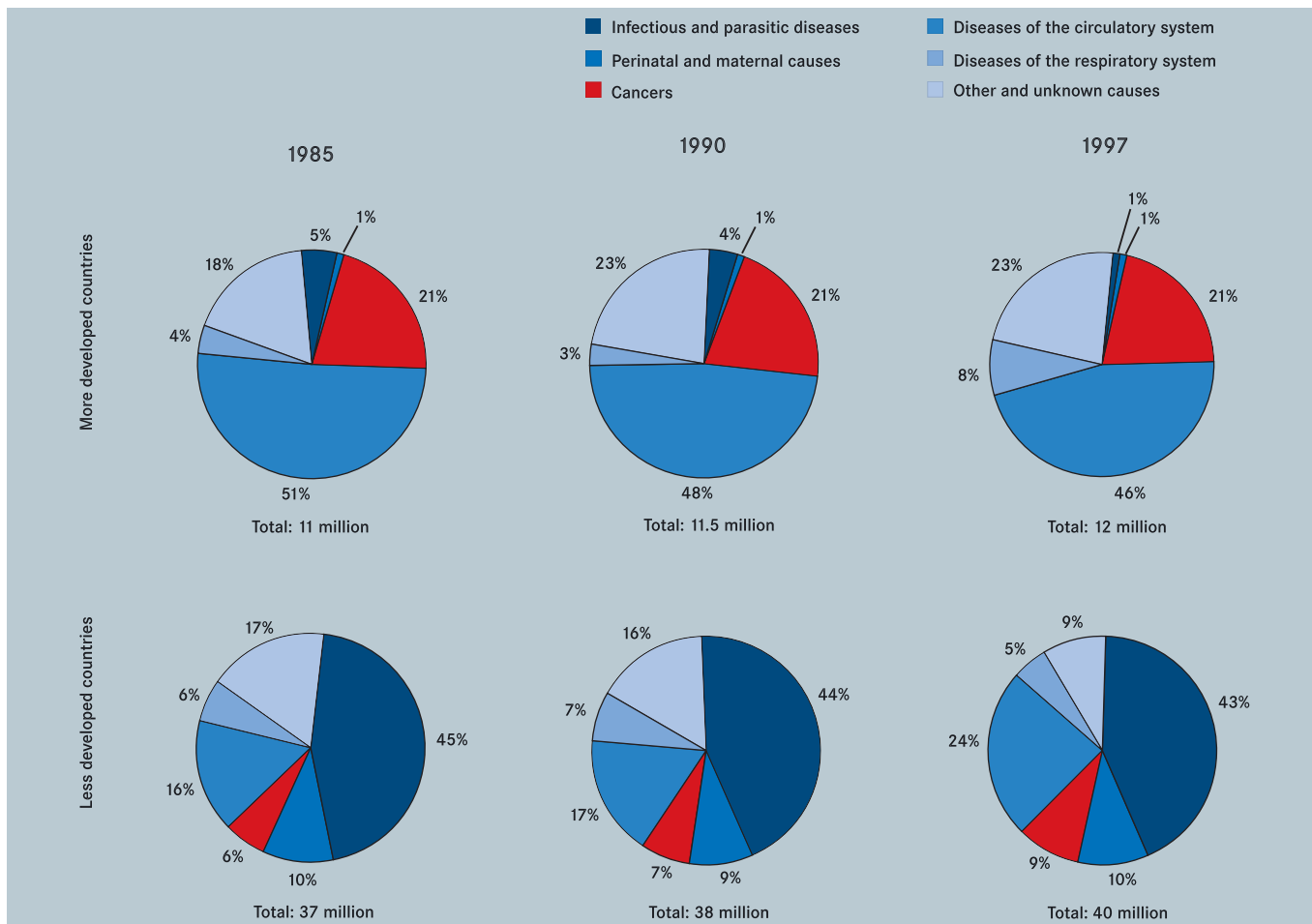


Fig. 7.17 Main causes of death in developed and developing countries, for 1985, 1990 and 1997. WHO World Health Report, 1998.

Equitable and effective access to care

To ensure equitable access to and provision of quality care, a cancer care delivery system has to be organized with due reference to cultural differences, individual attitudes and other determinants of access to health care. It should then be incorporated into the existing health care infrastructure in order to achieve efficiency, coordination and effective management. Ultimately, when relevant interventions are incorporated into standard medical practice, the benefits of state-of-the-art knowledge and practice will be available to all people, enhancing their health and well-being.

Effective mechanisms and procedures for improving access to health care, while

maintaining and raising the quality of provision and outcome of care, pose a challenge in all countries. The elimination or rapid decline in incidence of many infectious diseases shows that sufficient experience already exists to recognize and respond to the need for change in health care delivery and management. A “primary health care” approach could be used. Experience in health care delivery is a valuable asset that can be fruitfully applied in formulating and implementing meaningful public health policies for the control of cancer and other chronic diseases.

There is enough knowledge available to analyse the cancer burden and to apply resources where they will have the great-

est impact. Regardless of economic circumstances, a critical assessment of needs, appropriate planning and prioritization can curtail the toll of cancer worldwide. Additionally, an aspect of managing the development and implementation of cancer control strategies is to ensure that all members of the population benefit from such progress and that disparities are reduced. Attention must be given to ways of reducing the cost of cancer treatments and of translating laboratory research into clinical practice. Also required are improved methods of formulating and implementing public health policies and strategies that address tobacco control, infection control and healthy eating. Innovative approaches to cancer

treatment, including palliative care, are required. Above all, options must be determined for integrating a cancer control strategy into each country's national health service and for establishing the best way of collaboration to convey new developments in cancer research from the laboratory into health care delivery [7].

An agenda for action

The *World Health Report 1997* [12], the *WHO Developing a Global Strategy for Cancer* and *Our Vision for Cancer* from the Imperial Cancer Research Fund [13] illustrate some approaches for dealing with this problem. Priority action proposed here takes into account information contained in these reports.

After an assessment of the global cancer situation, and based on advances in scientific knowledge and in diagnostic and treatment technologies, as well as on experience gained in adapting and applying cost-effective interventions in clinical and public health practice, the following priorities are evident:

1. To promote and sustain the commitment of political decision-makers and the support of funding agencies, health care providers, educational institutions and the media to reduce the emerging burden of suffering and deaths due to cancer.

2. To support the development and implementation of a Global Strategy for Cancer Reduction, and associated national cancer control strategies, to deliver a package of essential medical and health interventions that are cost-effective and evidence-based for tobacco control, infection control, healthy diet, screening, treatment and care.

3. To develop, test and make available guidelines and protocols for the implementation of strategies based on systematic experimentation and evidence-based choice of efficient procedures for delivery of drugs and vaccines, and the promotion of effective approaches for informing and involving health professionals and the community in cancer control.

4. To mobilize adequate financial resources to strengthen the health infrastructure so that the package can be delivered as an integral part of health services. This would ensure increased access to these services.

5. To stimulate relevant research for fuller application of existing knowledge and cost-effective methods of detection and cure, and to accelerate research into new areas.

6. To establish a global network of professional societies and an information sharing mechanism, and to ensure that current knowledge is shared, research gaps are

identified and promising areas for reducing cancer burden are explored.

As "population ageing" will continue and possibly accelerate in the coming years, and as favourable economic prospects may lead to undesirable and unhealthy changes in lifestyle and behaviour, a cancer control strategy should be produced that can serve as a catalyst for change in health care delivery itself. It can be expected that the national strategies for cancer reduction that take into account cancer epidemiology, proven interventions, educational standards, existing resources and the economic status of the health system will contribute to a significant reduction in the global burden of cancer. The goal is a judicious mix of existing knowledge, technologies and available resources in order to develop cancer control programmes that can prevent at least a quarter of all cancers and cure at least a third of cancer cases. As a result of acting now, by the year 2020 countries can achieve significant reductions in cancer incidence and in mortality due to cancer. Opportunities exist - can they be exploited for the benefit of humankind?

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