EVIDENCE-BASED Cancer Prevention: Strategies for NGOs

A UICC Handbook for EUROPE

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UICC International Union Against Cancer
3 rue du Conseil-Général
1205 Geneva
Switzerland

Tel. +41 22 809 18 11
Fax +41 22 809 18 10
www.uicc.org

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Evidence-based Cancer Prevention: Strategies for NGOs

EUROPE

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Foreword

International Union Against Cancer

Cancer is a major and dramatically increasing cause of morbidity and mortality in the world. We have a clear opportunity to reduce the burden of cancer by focusing interventions on early detection and avoidable risks factors, most of which are linked to unhealthy behaviour. Cancer organisations play a crucial role in promoting appropriate interventions, in fostering behavioural and social changes that will have an impact on cancer risk and in ensuring that cancer control is given high priority on public agendas.

The International Union Against Cancer (UICC), together with the Swiss Cancer League and the French League Against Cancer, has taken the initiative of producing a handbook for European nongovernmental organizations, to assist them in setting up comprehensive cancer prevention programmes adapted to their national needs. This first handbook was prepared for Europe. As cancer patterns differ from region to region, adapted versions will be prepared for other areas of the world.

Civil society has long been involved in the fight against cancer. UICC is pleased to contribute to this effort by issuing this handbook.

John R. Seffrin
President

Foreword

Swiss Cancer League

The role of prevention as part of a comprehensive programme to combat cancer is indisputable. Of all the public health measures that could be implemented today to reduce the incidence and mortality of cancer, prevention offers the greatest potential. This potential can only be realised, however, if the measures taken are demonstrably effective.

A practical overview of the effectiveness of interventions in the prevention of cancer for those involved in prevention has been lacking up to now. This made it difficult for national and regional cancer organisations to develop and implement coherent, evidence-based strategies. For this reason, the Swiss Cancer League was extremely pleased to become involved in the joint initiative with the UICC and the French Cancer League with the objective of creating an overview of this nature.

This international approach brought together experts from various countries with a range of specialist knowledge and led to interesting new findings. Consequently, this publication is not simply a useful collection of knowledge concerning evidence-based interventions in the field of cancer prevention, but also a working aid which proposes priorities and offers recommendations for action.

The findings from this project are already being incorporated in Switzerland today in the current strategy discussions within the framework of formulating a national policy on combating cancer. In this way we hope that the commitment of the Swiss Cancer League can be quickly and profitably translated into action.

Franco Cavalli
President

Foreword

French League Against Cancer

The founding principles of the French League Against Cancer, developed in 1918, are still the basis for our long-term and realistic vision in the fight against cancer today. The principles include three areas of focus: patient support, prevention, and research. These three areas encompass the numerous needs in the fight against cancer and their association is the guarantee for a reduction in the burden of this disease.

However, despite past successes, we must recognise that on the dawn of this new century, we are still faced with a challenge that is twofold:
On one hand, the most recent scientific research confirms that cancer prevention activities will have the same impact on cancer mortality as treatment hopes to in the coming decade.
On the other hand, policy makers and health care professionals have been sensitised to a culture of cure and not one of cancer prevention.

It appears, therefore, that despite the years behind us in this fight against cancer, the synergies between these two areas have not been well integrated. Thankfully, with the propositions for the 2004 legislation regarding public health, the equilibrium appears to be on the horizon in France.

This book, beyond its obvious scientific interest, presents itself as a resource for this new challenge. It provides, for all those concerned, in particular nongovernmental organisations (NGOs), a foundation for determining the actions and steps to be promoted in the framework of the new law(s) governing public health.

To say prevention, is to say change. Change in habits, change in lifestyle - equally in the area of nutrition as in the area of physical activity.
To say prevention is also to say information. Disseminating information on the concrete actions needed to fight against the onset of cancer is the key in achieving the needed change. By thoroughly presenting the ensemble of scientific work prior to the development of cancer prevention activities, this handbook allows the French League Against Cancer and its partners to be involved in the new politics of public health at a national level as well as at a European level.

The work involved in making this book possible underlines the strong links between the French League Against Cancer and the International Union Against Cancer, of which the league was a founding member.

We hope that this book will provide everyone with the potential to define the stakes, the priorities and especially to build the awareness necessary that will allow all players involved to effectively modify knowledge, know-how, and well-being with regards to health.

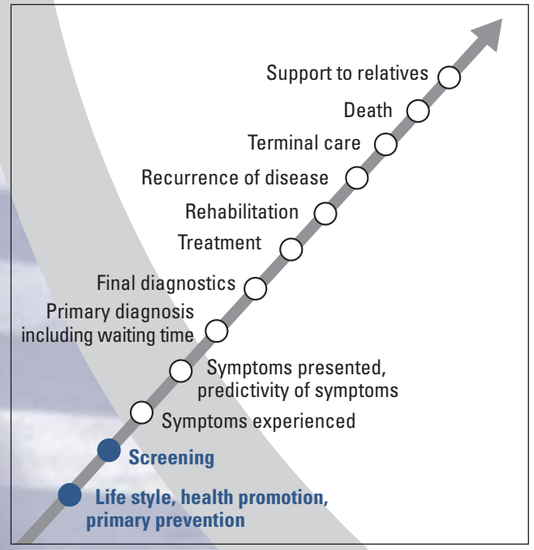
Henri Pujol
President

Introduction

Cancer diseases are major causes of death throughout the world. In the European Union almost 1.6 million new cases are observed annually, and cancer accounts for over 1 million deaths each year. In the various regions of Europe, cancers cause 24–27% of all deaths among men and 21–28% of those among women.

Cancer control entails many activities. This handbook addresses two of them: prevention and screening.

The cancer journey



Modified from an original diagram by Frede Olesen, Denmark

Cancer prevention and early detection

The cancer burden and cancer patterns reflect the way we live, and many changes in cancer incidence are due to changing patterns of life. Thus, the cancer burden is not a fixed entity but can be reduced by focused intervention. Research may not yet have identified all the causes of cancer but has already provided evidence that modifiable determinants of risk account for about one-third of all cancers. Prevention and early detection can thus play a major role in saving lives.

A handbook for Europe

This handbook is based on information from throughout the world, but it is written for the context of Europe. Although the current burdens of cancer diseases and risk factors differ between Eastern and Western Europe, these two areas are now coming together, with a shared responsibility in cancer prevention. This book aims to facilitate that work.

An evidence-based handbook

The findings presented in this handbook are based on reviews of the effectiveness of interventions against a number of cancer risk factors. All the chapters have been peer-reviewed. The following points should be considered when using this handbook:

- Proving the effectiveness of an intervention can be difficult, and the quality of the evidence summarized here is not always comparable. Some was derived from randomized controlled trials, but, for many issues of lifestyle change, we have relied on other types of evidence.
- The evidence presented has been published in the international scientific literature. Information and evaluations of national activities should also be considered when national or local strategies are being developed.
- Health promotion and prevention are based on complex interactions, and the outcomes depend on environmental and individual factors. Interventions that are effective in one context may not be transferable to another.
- New, innovative strategies need to be developed and evaluated. An activity that has not been proven to be effective can be chosen, but its use must be considered as research and be followed up by an appropriate evaluation.

A handbook for NGOs

This handbook presents evidence of the effectiveness of interventions for cancer prevention and early detection and examines effective strategies from the point of view of possible action by organized civil society, particularly NGOs.

The UICC, the umbrella organization for cancer organizations, has taken the initiative to produce a handbook that can be used by NGOs in instituting comprehensive cancer prevention and setting priorities. The main objective of cancer organizations is to fight cancer. To reduce the burden of cancer, health-care providers, policy-makers and NGOs must concentrate their resources on avoidable risk factors and early detection. Nevertheless, the impact of cancer control may be limited by failure to translate knowledge into behavioural and social changes. As no single intervention is effective under all circumstances, the effectiveness of cancer control interventions must be reviewed before a population-based strategy to control the disease is implemented. A key role of NGOs is forming alliances among important stakeholders in the public and private sectors for implementation of initiatives based on the best evidence available. Cancer associations should be the spearhead of efforts in civil society to prevent cancer.

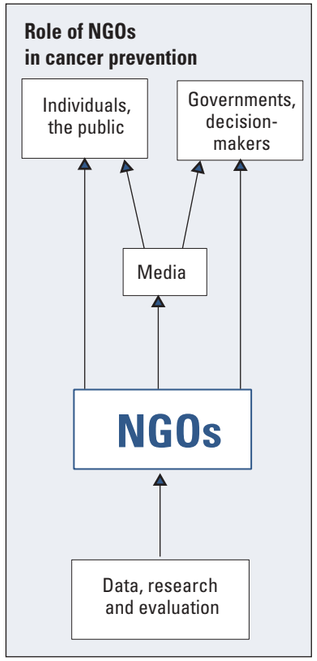
This handbook provides scientific evidence to help national and local cancer organizations develop effective strategies adapted to the burdens of disease and risk factors in their own countries, taking into consideration the political situation, the social environment and, of course, available resources. NGOs can work for cancer control by using the best available evidence to inform the public, to keep cancer control on the public agenda and to pressure governments and decision-makers on issues related to cancer control, either directly or via the media.

An evidence-based handbook

Some risks can be modified. An intervention to prevent cancer must be evaluated for its efficacy (how well it modifies risks) and its effectiveness (how well it can be used in the community). Many programmes, however, are not fully evaluated, and so it is difficult to determine their efficacy or effectiveness. In addition, data on cost-effectiveness are often lacking. This handbook presents current knowledge about cancer prevention; nevertheless, cancer prevention is a rapidly evolving field and new evidence is being published continually.

This book examines:

- the burden of cancer in Europe with its geographical variations;
- the role of social factors;
- theoretical aspects of behavioural change;
- general aspects of the evaluation of interventions;
- the efficacy of preventive interventions against the major risk factors (tobacco use, inappropriate diet, lack of physical activity, alcohol use, infections, hazardous occupations and ultra-violet radiation); and
- the benefits and risks of screening programmes.



The final chapter offers general recommendations for NGOs, for setting priorities and designing comprehensive cancer prevention programmes.

This book focuses on the main avoidable risk factors for cancer that can be considered the most appropriate for NGO activities. Thus, factors such as iatrogenic risks (those associated with medical treatment), ionizing radiation and environmental pollution are not addressed.

The handbook was produced by an international, multidisciplinary panel assembled under the auspices of the UICC. After a workshop to discuss the goals and contents of the book, draft papers were written by members of the panel and revised by an editorial team. A second workshop was held to discuss the edited chapters, and the editorial group finalized the last revisions.

The authors welcome comments and suggestions about the usefulness of this handbook.

This book is available in several languages and can be downloaded from http://www.uicc.org

Europe's cancer burden

Each year in Europe, cancer kills about 2 million people and more than 3 million new cases appear. Almost 6 million people are currently living with cancer.

The most common sites at which cancers appear are breast in women, prostate and lung in men and colon and rectum in both sexes. Cancer is responsible for more than one death in four. Lung cancer kills more people than any other cancer. More than 40% of cancer deaths in Europe are presently due to tobacco, diet and infections. Tobacco smoking - past and current - and unhealthy life-style habits, together with the increasing proportion of elderly people, will result in a doubling of the number of new cases by 2020, particularly in Southern and Eastern Europe. All over Europe, the five-year survival rate of cancer patients is between 30% and 60%. In recent decades, the survival rates from many types of cancer have improved substantially, except for cancers of the lung, pancreas and liver. Survival rates from cancer differ considerably from one country to another, indicating that in many places the cure rates could be improved.

Europe's cancer burden

Hélène Sancho-Garnier
Epidaure, Department of Epidemiology and Prevention, Regional Cancer Centre, Montpellier, France

Fabio Levi
Cancer Registry of the Canton of Vaud, Lausanne, Switzerland

Paola Pisani
International Agency for Research on Cancer, Lyon, France

Elsebeth Lynge
Institute of Public Health, University of Copenhagen, Copenhagen, Denmark

Cancer control programmes comprise two basic components: assessing the magnitude of the cancer burden and estimating the effect of avoiding exposure to identified causative agents.

Estimating the burden

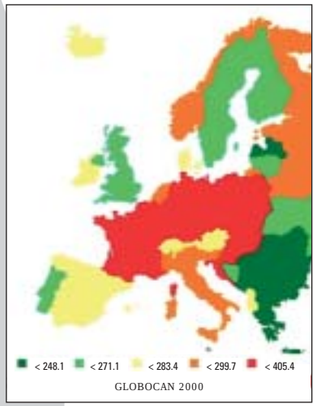
The first step in implementing efficient cancer prevention strategies is to assess the magnitude of the cancer problem in the geographical area in which the strategies are to be implemented. Much work has been focused on quantifying patterns of mortality and incidence and, more recently, of the survival of cancer patients [1–3]. At the end of the twentieth century, almost 2.8 million new cases and 1.9 million deaths from cancer were being observed each year throughout Europe, placing cancer diseases as the second cause of death. The proportion represented by deaths from cancer among deaths from all causes varies from 24% in Eastern Europe[1] to 27% in Southern Europe for males and from 21% in Eastern Europe to 28% in Northern Europe for females [4]. The relatively low frequency among women in Eastern Europe is related to the fact that they have a higher proportion of deaths from cardiovascular diseases. When the comparisons are restricted to people aged 45–64, the relative frequency increases to 45–50% for both sexes in almost all countries, placing cancer diseases as the first cause of premature deaths.

[1] *For the purposes of this chapter, Europe is divided into four regions:*

Eastern: *Belarus, Bulgaria, Czech Republic, Hungary, Moldova, Poland, Romania, Russian Federation, Slovakia, Ukraine.* ***Northern:*** *Denmark, Estonia, Finland, Iceland, Ireland, Latvia, Lithuania, Norway, Sweden, United Kingdom.* ***Southern:*** *Albania, Bosnia and Herzegovina, Croatia, Greece, Italy, Macedonia, Malta, Portugal, Slovenia, Spain, Federated Republic of Yugoslavia and Montenegro.* ***Western:*** *Austria, Belgium, France, Germany, Luxembourg, Netherlands, Switzerland*

Figure 1

Incidence of and mortality from cancers at all sites except skin in males in Europe

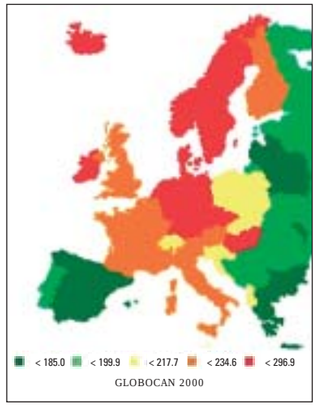


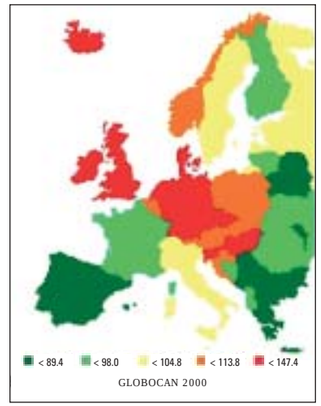
Geographical distribution

Figure 1 shows the incidence and mortality rates for males in Europe (standardized by age to the world population) [2] for all types of cancer except skin cancer other than melanoma. The incidence rates vary from 263 per 100,000 males in Northern Europe to 319 in Western Europe. The age-standardized mortality rate is lowest in Northern Europe (168) and highest (200) in Eastern Europe. There are, however, large variations within areas of Europe, as shown on the maps. The ratio of incidence/mortality, which gives a rough estimate of the proportion of cure, is highest (1.71) in Western Europe and lowest (1.45) in Eastern Europe.

Figure 2

Incidence of and mortality from cancers at all sites except skin in females in Europe





The incidence rates in the female population (Figure 2) are generally lower, with a smaller range than among males, varying from 194 per 100,000 females in Southern Europe to 235 in Northern Europe. The mortality rate is lowest in the South (93) and highest in the North (122). The incidence/mortality ratios show little variation, from 1.92 in Northern Europe to 2.1 in Western Europe. These ratios are clearly higher in females than in males because cancers in females are more readily cured.

The relative frequency of cancers at different sites also varies from one country to another and may partly explain the disparities in the incidence/mortality ratios for males. Each country should examine its own data and determine its priorities for cancer prevention and care. Nevertheless, some common goals can be identified for Europe. The most frequent cancers among men are those of the prostate, lung and colon and rectum in Northern and Western Europe; cancers of the lung, colo-rectum and bladder in Southern Europe; and cancers of the lung, stomach and colo-rectum in Eastern Europe (Figure 3). Among women, the rates of breast and colo-rectal cancers are high in all European regions; the rates for lung cancer are high in Northern and Western Europe, and high rates are seen for cancer of the corpus uteri in Southern Europe and for cervical cancer in Eastern Europe (Figure 4).

Time trends

Trends in cancer incidence

Data on the incidence of cancer are provided by cancer registries. Population-based cancer registration is a relatively recent development and remains restricted to certain countries or parts of countries.

Incidence rates by country are frequently estimates derived from cancer mortality rates and the available incidence/mortality ratios.

As the incidence of cancer increases steeply with age, and because life expectancy is improving everywhere in Europe, the number of cancer cases is on the increase. At the same time, about one-third of new cancer cases are related either to greater exposure to risk factors or to the fact that more have been found by more intensive screening [5]. During the next 20 years, the impact of both ageing and increasing exposure to risk factors on the absolute numbers of cases will be quite dramatic.

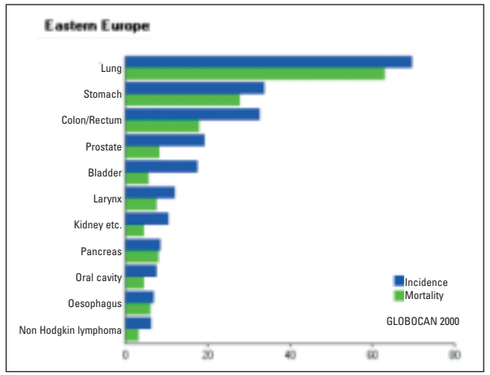
Cancer incidence rates have generally increased in both males and females throughout Europe since the Second World War [6]. Three groups of trends have been observed over the past 20 years:

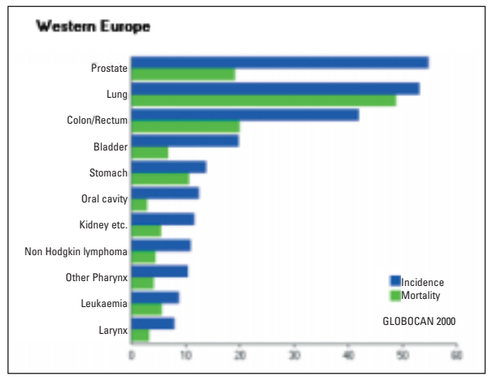
- In countries in Southern and Western Europe—Austria, Belgium, France, Germany, Luxembourg, Italy, Spain and Switzerland—men have experienced a large increase in the incidence of prostate cancer, a decrease or plateau in the incidence of lung cancer and a substantial decrease in the incidence of stomach cancer. Among women, the incidence of breast cancer continues to increase [7], lung cancer rates are rising especially for young women [8], and the incidences of stomach and cervical cancers are greatly decreasing. In both sexes, the

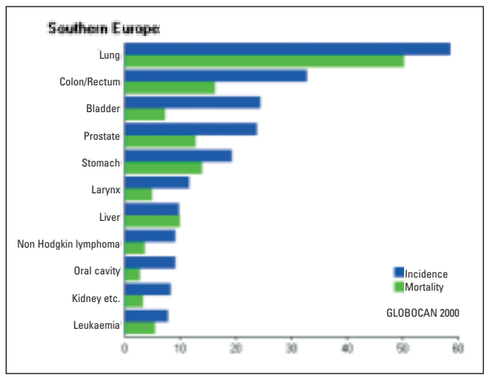
Figure 3

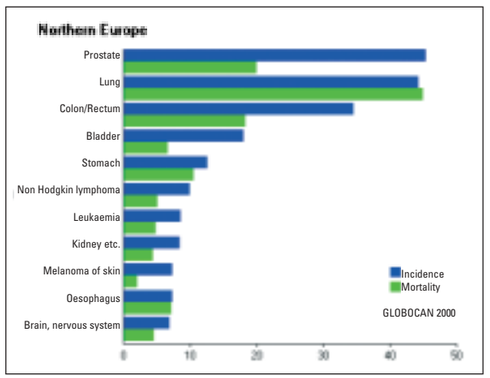
Incidence of and mortality from major cancers in men in Europe

*** ASR (World) rates standardized by age to the World population**









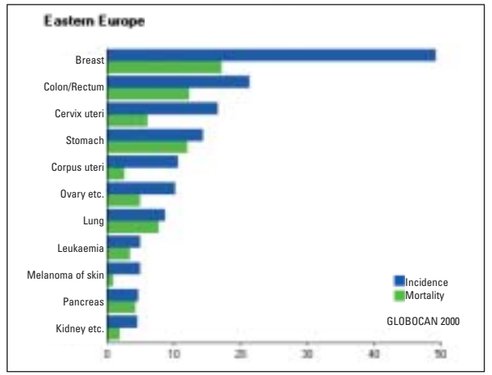
incidence of colo-rectal cancers is increasing slightly.

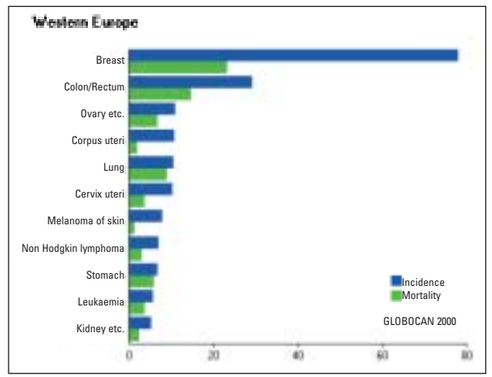
- In Northern European countries-Ireland, the Netherlands, the Nordic countries and the United Kingdom-there has been a decrease in the incidence of lung cancer among men. In the Netherlands and the Nordic countries, there has been a dramatic increase among women, whereas in Ireland and the United Kingdom, women's lung cancer rates have begun to fall [8]. The trends for other cancer sites are similar to those in southern and western Europe.
- In Eastern Europe and part of Southern Europe, the incidences of lung cancer in men and breast cancer in women are still increasing. For both sexes, the incidence of stomach cancers is still high, and for women the incidence of cervical cancers is also high.

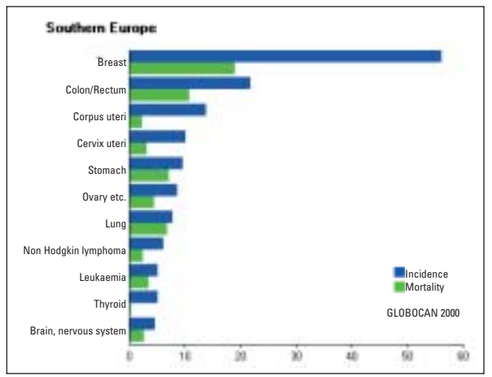
Figure 4

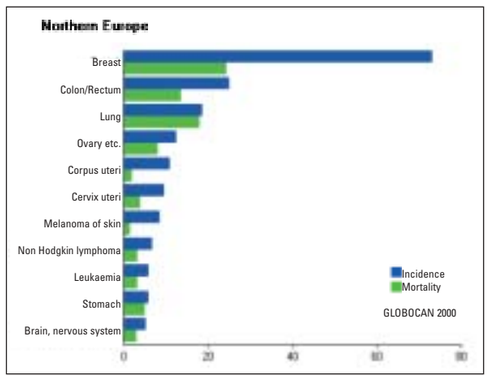
Incidence of and mortality from major cancers in women in Europe

*** ASR (World) rates standardized by age to the World population**









Trends in incidence by cancer site

The incidence of lung cancer increased everywhere among men until the 1960–70s, when the beginning of a decrease was first observed in the United Kingdom. A decrease or a plateau is now also being observed in other Northern and Western European countries. Among women, the incidence of lung cancer is increasing alarmingly all over Europe, except in Ireland and the United Kingdom where the incidence has been decreasing since the 1980s [8]. Lung cancer incidence trends match the tobacco consumption trends of previous decades in each country.

The incidence rates of colo-rectal cancer have been stable or slightly increasing, except among younger individuals in Denmark and the United Kingdom, where they are decreasing [6].

The incidence of prostate cancer is increasing in all countries. This increase may, however, reflect the increased diffusion of screening

for prostate-specific antigen over the past 10 years [9] (Figure 5). Men have also had an increase in the incidence of cancers of the head and neck and oesophagus, except in France where the incidence of such cancers is clearly decreasing, consequent to the decrease in alcohol consumption over the past 20 years [10].

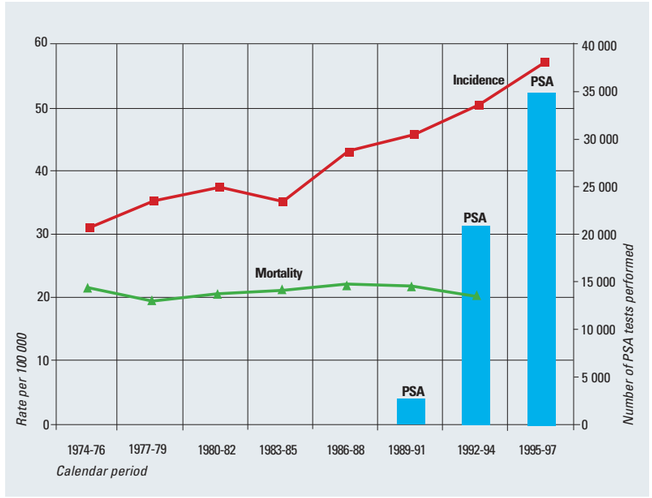
The incidence of breast cancer has increased by 1–3% per year over the past 30 years. Nevertheless, the rates have stabilized in England, France, Italy, Scotland and Wales, and have recently declined in Iceland and Sweden [7]. The incidence of cervical cancer has generally decreased, except in Eastern Europe and among young women in Germany, Norway and the United Kingdom. The decrease may be due in part to screening programmes.

The incidence of stomach cancer has been decreasing for both men and women at an annual rate of 5% for the past 25 years, except in Greece, Italy, Portugal and most eastern European countries, where the decrease has been much smaller and more recent. An increase in the incidence of adenocarcinomas of the oesophagus and gastric cardia has been observed in the past few years in Denmark, Italy, Switzerland and the United Kingdom [11].

The incidence rates for melanoma, non-Hodgkin lymphoma and renal and thyroid cancers have been increasing in all parts of Europe. In Southern Europe, increase incidences of pancreatic and liver cancers have been observed.

Figure 5

Trends in incidence of and mortality from prostate cancer and testing for prostate-specific antigen (PSA), cantons of Neuchâtel and Vaud, Switzerland [9]



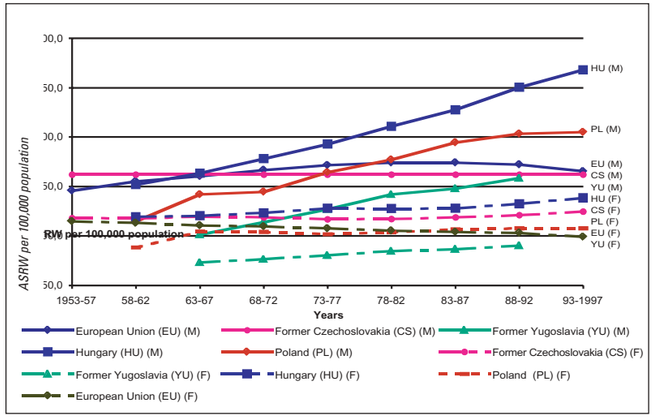
Trends in cancer mortality

Data on deaths from cancer (mortality rates) are derived from death certificates. In Europe, data are available in most countries since 1950.

In the 15 Member States of the European Union (EU), a long-term rise in age-standardized mortality rates, which peaked in 1988, fell for males and females combined by 9% between 1988 and 1997 [12]. In some countries, however, and particularly in Eastern Europe, the trends in mortality rates are still rising [13], as illustrated in Figure 6. Long-term trends in mortality from major cancers among men in the EU are shown in Figure 7. The fall in mortality rates from lung cancer has been appreciable (–11%), from a peak of 52.4 per 100,000 men in 1985–89 to 46.6 in 1995–98 (Figure 8). A fall of 11% was also observed for deaths from colorectal cancer. In contrast to the increase in the incidence of prostate cancer, the mortality rates from cancer at this site have tended to stabilize or to decline somewhat over the past few years in some countries. The decrease in mortality from gastric cancer has persisted, with a fall of 30% during the past decade alone. Pancreatic cancer mortality rates have shown a decline of 3% in recent years. During the past decade, mortality rates have decreased by 12% for urinary bladder cancer and by over 5% for cancers of the mouth, pharynx and oesophagus.

Figure 6

Trends in mortality rates from malignant neoplasms in some eastern European countries and in the European Union, between 1953–57 and 1993–97, in males and females



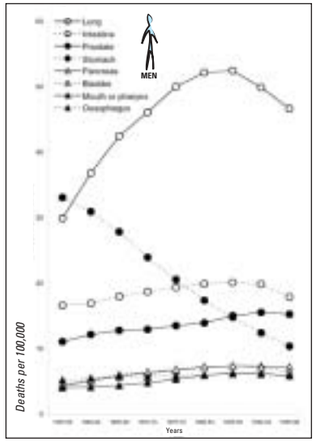
ASR (world), rates adjusted by age to the world population

Source: WHO [4]

Corresponding figures for women in the EU are given in Figure 9. The mortality rates declined during the past decade, by 7% for breast cancer, 21% for colo-rectal cancer, 26% for uterine (cervix and corpus) cancer, 31% for stomach cancer and 11% for leukaemia. The mortality rates were stable for ovarian and pancreatic cancers, but there was a 15% rise in female deaths from lung cancer between 1985 and 1995 all over Europe, except in Ireland and the United Kingdom. Lung cancer is therefore approaching colo-rectal cancer as the second leading cause of mortality from cancer among women in the EU [12].

Figure 7

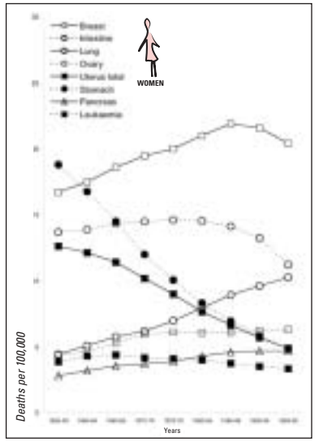
Trends in mortality rates from cancers at major sites among men in the European Union



Source: Levi et al [12]

Figure 9

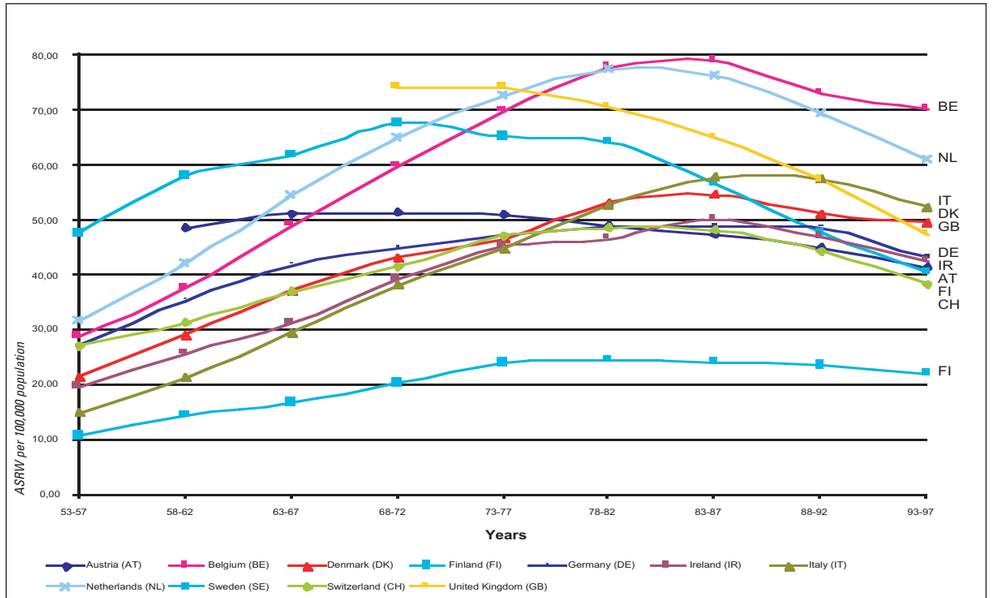
Trends in mortality rates from cancers at major sites among women in the European Union



Source: Levi et al [12]

Figure 8

Trends in age-adjusted mortality rates from malignant neoplasms of the lung among men in 11 European countries, between 1953–57 and 1993–97

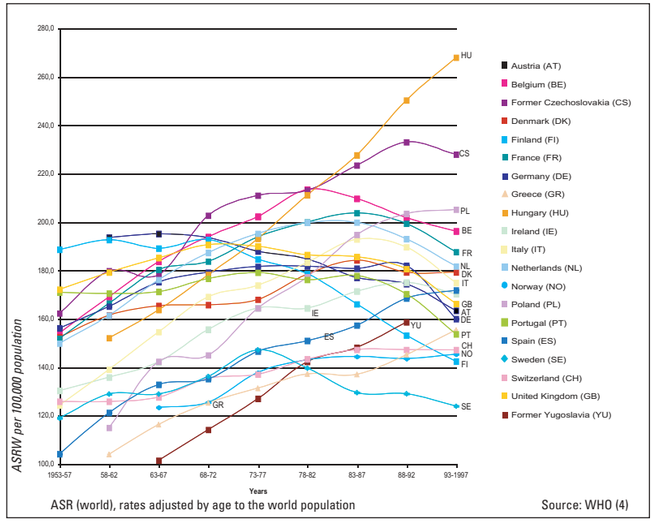


ASR (world), rates adjusted by age to the world population

Source: WHO (4)

Figure 10

Trends in age-adjusted mortality rates from malignant neoplasms at all sites among men in 20 European countries, between 1953–57 and 1993–97



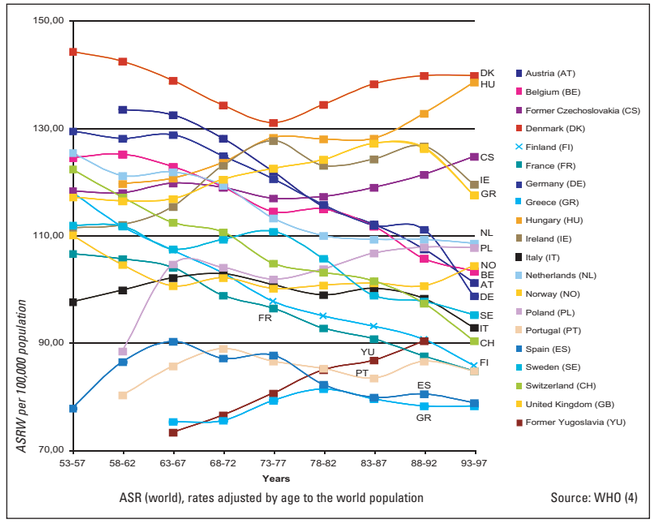
ASR (world), rates adjusted by age to the world population

Source: WHO (4)

In all, the rates of death from most of the common cancers have shown favourable trends for both sexes over the past decade in the 15 Member States of the EU, but not in other European countries, particularly in Eastern Europe (Figures 10 and 11) [4,14].

Figure 11

Trends in age-adjusted mortality rates from malignant neoplasms at all sites among women in 20 European countries, between 1953–57 and 1993–97

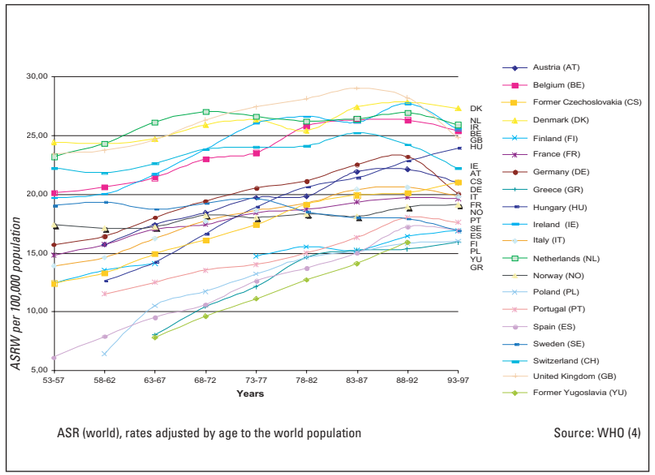


ASR (world), rates adjusted by age to the world population

Source: WHO (4)

Figure 12

Trends in age-adjusted mortality rates from malignant neoplasms of the breast among women in 20 European countries, between 1953–57 and 1993–97



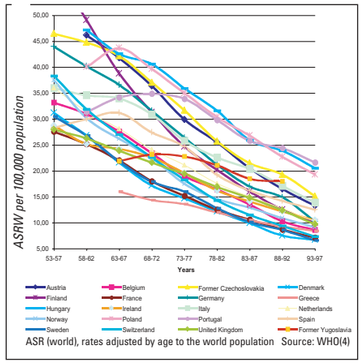
ASR (world), rates adjusted by age to the world population Source: WHO (4)

In the EU, some of the decrease in mortality from leukaemia and breast cancer is due to therapeutic advances [15]. The decrease in death from breast cancer is attributable to earlier diagnosis and screening, which could account for the differences between countries (Figure 12). Screening is the major determinant of the persistent fall in mortality from cancer of the cervix uteri [16].

Improvements in food preservation and nutrition balance are probably the main determinants of the favourable trends in stomach cancer in both sexes (Figures 13 and 14). Mortality rates from several neoplasms that had shown long-term increases up to the mid-1980s in the EU have tended to level off over the past decade.

Figure 13

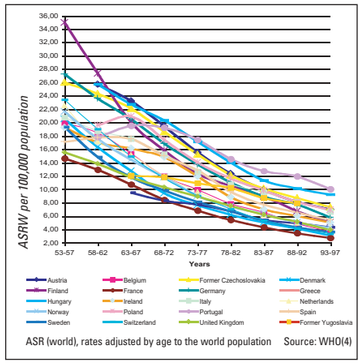
Trends in age-adjusted mortality rates from malignant neoplasms of the stomach among men in 20 European countries, between 1953–57 and 1993–97



ASR (world), rates adjusted by age to the world population Source: WHO(4)

Figure 14

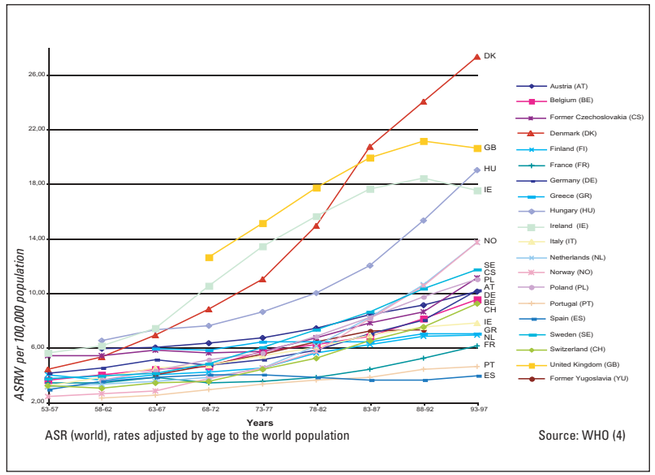
Trends in age-adjusted mortality rates from malignant neoplasms of the stomach among women in 20 European countries, between 1953–57 and 1993–97



ASR (world), rates adjusted by age to the world population Source: WHO(4)

Figure 15

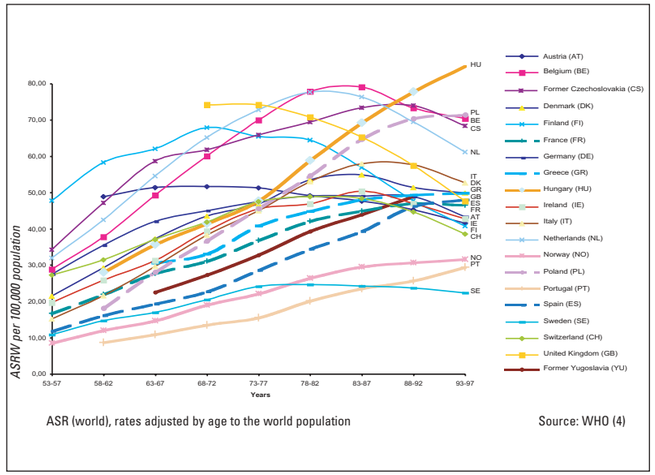
Trends in age-adjusted mortality rates from malignant neoplasms of the lung among men in 20 European countries, between 1953–57 and 1993–97



ASR (world), rates adjusted by age to the world population Source: WHO (4)

Figure 16

Trends in age-adjusted mortality rates from malignant neoplasms of the lung among women in 20 European countries, between 1953–57 and 1993–97



ASR (world), rates adjusted by age to the world population Source: WHO (4)

These include pancreatic cancer for both sexes and ovarian cancer. The main difference in cancer mortality rates between females and males in the EU is for lung and other tobacco-related cancers (Figures 15 and 16). Owing to declines in incidence in some countries, the mortality rates from lung cancer have decreased overall by more than 10% among men over the past 10 years. A similar fall was observed for urinary bladder cancer, which may also indicate decreased exposure to occupational carcinogens. With the exception of France, where there were large decreases [10], the decrease in mortality from cancers of the head and neck and oesophagus was smaller (3–5%). These cancers are strongly related to consumption of both alcohol and tobacco.

In contrast, except in Ireland and the United Kingdom, the rates of lung cancer mortality among women in the EU have risen by 15% over the past decade, following the increase in incidence which reflects the persistent spread of the tobacco epidemic among European women. In some northern European countries, mortality from lung cancer exceeds that from breast cancer.

With non-Hodgkin lymphomas in both sexes, lung cancer among women is therefore one of the few cancers that has shown an upwards trend in mortality rates in the EU. The rates for death from lung cancer among women in the EU (except for the high rates in Denmark, Ireland and the United Kingdom) are, however, still about one-third of those of women in the USA and 50% lower than the rates for death from breast cancer in the EU [12]. Integrated, effective interventions to reduce smoking should therefore still help European women to avoid the current tobacco-related cancer epidemic occurring presently in Denmark, Ireland, the United Kingdom and the USA.

Trends in survival from cancer

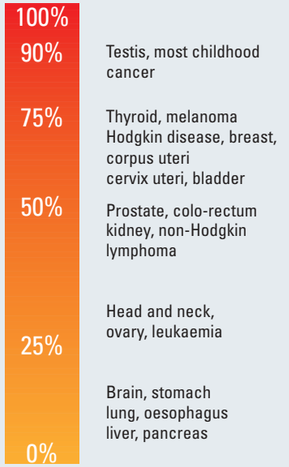
In the EU, the rates of long-term (5–10 years) survival from many types of cancer have improved considerably over the past few decades, because of advances in early detection and treatment. Other reasons are probably manifold and vary with cancer site.

Early detection has probably made a large contribution to increasing survival rates after cancers of the cervix, thyroid and prostate and melanoma. Improvements in survival from other cancers, such as of the testis, Hodgkin lymphoma and childhood cancers, are attributable mainly to new treatments. For breast cancer, early detection and improvements in treatment are the main explanations of the increased survival. Nevertheless, no progress has been made in the prognoses for lung, liver or pancreatic cancers. Figure 17 presents 5-year survival rates from cancers at various sites, estimated from the numbers of incident cases in 1985 and 1989 in the EU [3].

The Eurocare-2 study [3] showed that European populations vary considerably in their rates of survival from cancer, possibly indicating that cancer care facilities could be improved in some areas. The rates for tumours with a good prognosis generally appear to be lower in Eastern Europe than in other areas. This study showed that the significant factors that influence survival rates are: the proportion of the gross national product spent on health, the per cent unemployment, the number of hospital beds, the number of computed tomography scanners available per million population, life expectancy at birth, and sex. For most tumours that affect both sexes, women survive longer than men, probably partly due to greater body awareness, which leads to earlier diagnosis. These findings indicate that inequality of access to and availability of health facilities may contribute to inter-country differences in survival.

Figure 17

Five-year survival rates in 16 European cancer registries



Avoidable cancers

The second fundamental step in any cancer control programme, after the magnitude of the cancer problem has been assessed, is to estimate the expected effect, expressed as the number of cases or deaths that could theoretically be prevented by avoiding exposure to causative agents.

As mentioned above, the first step is to quantify the proportion of the cancer burden that can be explained by known causes. These figures provide the baseline of maximum achievable benefit relative to the total burden. In most cases, however, the probable impact will be smaller, as it depends on whether the exposure can be modified and, if so, on the efficacy of the intervention in reducing the prevalence of the exposure.

It has been known for a long time that risks for cancer are determined by the environment in general, health behaviour and external factors. This is illustrated, for example, by the observation in 1713 of an excess risk for breast cancer among nuns and the observation in 1795 of an excess risk for scrotal cancer among chimney sweeps.

Data on cancer-causing agents accumulated during the 1970s, and these are reviewed in the *Monographs on the Evaluation of Carcinogenic Risks to Humans* of the International Agency for Research on Cancer (IARC). Many of the agents evaluated were industrial chemicals, and the evidence on carcinogenicity for many of them came from experiments in animals. Interest therefore naturally arose in quantifying the contribution of these agents to the causation of human cancer. In 1979, Higginson and Muir [17] analysed data on cancer incidence from 1973, to identify the lowest observed rate for each cancer site. On the basis of this analysis, they reached the conclusion that '80% of all cancers are due to environmental causes and are therefore in principle preventable.'

The first comprehensive quantification of the causes of human cancer was performed in 1981 by Doll and Peto [18], who quantified the contributions of various causes to cancer deaths in the population of the USA under 65 years of age. They identified two major causes: tobacco smoking and diet. Tobacco smoking was estimated to be the cause of 35% of all cancers. The evidence that diet was the other main cause was mostly indirect, however, and the data were often inconsistent. It was thus assumed that diet was responsible for somewhere between 10% and 70% of human cancers, with 30% as the best point estimate.

Since that time, few new causes of cancer have been identified. Identification of the role of human papillomaviruses (HPVs) in cervical cancer has nonetheless further increased the perspectives for cancer control through immunization, which were opened by the finding that hepatitis B virus and other viruses were associated with cancer. In areas such as nutrition, which once appeared to be promising, little definitive evidence amenable to primary prevention has been obtained. Table 1 lists the main groups of factors that have been shown consistently to increase the risks for cancers at specified sites.

Not all the identified causes of cancer are equally modifiable. For example, women who have their first child after the age of 35 have twice the risk for breast cancer as women who have their first child before the age of 30. A distinction must therefore be made between identified causes of cancer and avoidable causes of cancer. There is, of course, no clear line between the two, as it depends on the extent to which we find our environment modifiable.

In 1997, the number of avoidable cancers was estimated for the Nordic countries [19] on the basis of data on cancer incidence, as all the Nordic countries have high-quality, nationwide cancer registers. In addition, data on the prevalence of exposure to cancer risk factors were used. Diet was not included in the estimation owing to uncertainty about the associated risk estimates and the lack of detailed data on food intake, and all liver cancers were attributed to excessive alcohol consumption. The estimates are listed in Table 2. A total of 27% of all cancers were estimated to be

Table 1

Factors that increase risks for cancer at the indicated sites

Cause group	Associated cancer site
Active and passive tobacco smoking	Lung, oral cavity, pharynx, larynx, oesophagus, urinary bladder, stomach, pancreas, liver, kidney
Diet, excess body weight, little physical activity	Colon, breast after menopause, endometrium, kidney
Alcohol consumption	Head and neck, oesophagus, liver, breast
Reproductive history	Breast, cervix, endometrium, ovary
Occupational exposures	Lung, urinary bladder, kidney, sinus, larynx, haematopoietic system
Ionizing radiation, ultraviolet radiation	All malignant neoplasms, skin, brain and nervous system
Infectious agents	Liver, stomach, cervix uteri, ano-genital organs, haematopoietic system, urinary bladder

Table 2

Proportions of all cancers avoidable in the Nordic countries annually, around the year 2000, both sexes

Environmental or lifestyle factor	%
Tobacco smoking	14.2
Passive smoking	0.1
Alcohol consumption	1.1
Occupation	1.7
Radon	0.2
Man-made ionizing radiation	1.9
Solar radiation	4.2
Obesity (body mass index > 30)	0.6
Infection with human papillomavirus or *Helicobacter pylori*	2.6
Total	**26.6**

Source: Olsen et al [19]

avoidable, with tobacco smoking as the main contributor.

Some cases of liver cancer in (mostly Southern) Europe may be caused by infection with hepatitis viruses. This is the background for the recent EU recommendation for hepatitis B virus immunization programmes [20]. IARC has since estimated that more than 40% of cancer deaths in Europe are presently due to tobacco, diet and infections [21]. The estimates given above are for cancers that can be avoided by changing exposure, which is usually considered to be primary prevention. Another cancer control measure is secondary prevention in the form of early detection by screening and early diagnosis. The aim of early detection is to reduce mortality from cancer. Some cancer screening tests also detect precancerous lesions, thereby leading to prevention of the development of invasive tumours. Cervical dysplasia is detected by Papanicolaou (Pap) smears, and it has been estimated that 91% of squamous-cell carcinomas of the cervix uteri can be avoided by Pap smear screening every third year [22]. There is increasing evidence that removal of adenomas detected in the large bowel by flexible sigmoidoscopy and colonoscopy [23] decreases the incidence of colorectal cancer [23], and adenomas. Cancers at some sites can therefore be avoided by screening. The following chapters discuss the various possibilities for decreasing cancer risks and decreasing mortality due to these diseases.

The following chapters discuss the various possibilities for decreasing cancer risks and decreasing mortality due to these diseases.

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Social inequalities in cancer

Fighting inequalities in the incidence of cancer is not straightforward because the social gradient in different cancer diseases is not uniform, and the social gradient in a given cancer disease is not stable over time.

Tobacco smoking was and is a huge social epidemic. It has spread from those who could afford it to all layers of society. When the adverse health consequences of tobacco smoking were recognized, the upper social classes were the first to quit smoking. Tobacco smoking is an individual habit, but exposure nevertheless depends on political, economic and social factors, which have to be taken into account in the fight against tobacco.

Obesity is the new social epidemic. A sedentary life style started among people who could afford cars and rich food, but obesity is now primarily a burden of the lower social classes. In the combat against obesity, we have to work not only at the individual level but also against the obesogenic environment, by incorporating physical activity and healthy food, not as additions but as integrated components of daily life.

Social inequalities in cancer

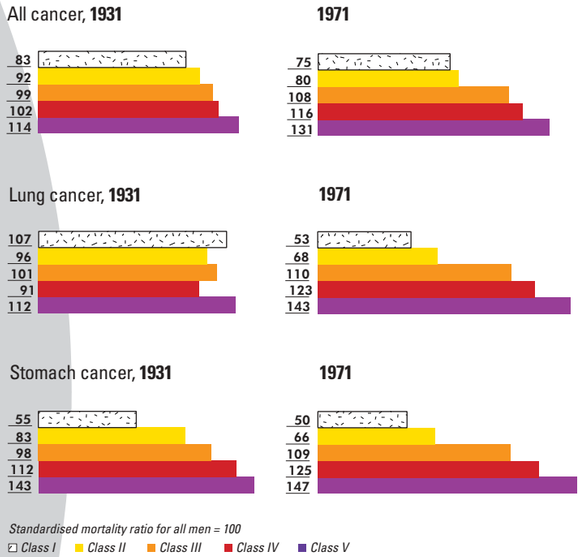
Elsebeth Lynge
Institute of Public Health University of Copenhagen

Data on cancer mortality by social class were first published for England and Wales in 1911 [1], and it was evident even at that time that deaths due to cancer were distributed unequally in the population. Socioeconomic differences in cancer were never, however, a starting point for research into causes, as geographical differences in cancer have been. Socioeconomic differences in overall mortality have always been an issue of political concern, but socioeconomic differences in cancer have not. As a result, relatively little attention has been given to them.

It is the purpose of this chapter to present key data on socioeconomic differences in cancer incidence and mortality in Europe, and to put forward ideas for fighting inequalities. The fight against cancer is conducted at two levels: against getting cancer and against dying from cancer. This chapter deals only with the first and does not address social inequalities in access to cancer screening and treatment.

Figure 1

Cancer mortality by social class for men in England and Wales



Standardised mortality ratio for all men = 100

Class I *Class II* *Class III* *Class IV* *Class V*

Historical perspective

Understanding of the social dimension of health owes much to the decennial supplements on occupational mortality in England and Wales published between 1851 and 1982. The results are often presented as standardized mortality ratios[1].

Logan [2] undertook the impressive work of collating the data on cancer mortality from these volumes into easily readable tables. Figure 1 shows the mortality rates for men in England and Wales by social class from cancers at selected sites in selected years. Social class I represented professionals and the upper classes, and social class V included unskilled workers. There was a clear gradient in overall cancer mortality in both 1931 and 1971, with the lowest mortality rate in social class I and the highest in social class V. The pattern was, however, not uniform across cancer sites, nor was it stable over time.

In 1931 among men, mortality from lung cancer was fairly equally distributed, whereas a steep social class gradient developed later, and in 1971 lung cancer was roughly three times more common among men in social class V than among those in social class I. The equal distribution of lung cancer in 1931 probably reflected mixed causes: whereby the cases among men in social class I were due primarily to those smoking, those among men in social class V were due primarily to occupational exposures, such as combustion products, silica dust, asbestos and chromium and nickel compounds. During the First World War, cigarette smoking spread to men in all layers of society, and tobacco was added to the burden of other lung carcinogens in the lower social classes. When tobacco was shown to cause lung cancer in the early 1960s, the upper social classes were the first to quit smoking. The steep social class gradient in lung cancer among men in 1971 was a result of this process.

Stomach cancer has always been a disease of poverty. The incidence in developed countries has declined over the past 50 years, owing to better provision of fresh food. Figure 1 shows that the decline in mortality by 1971 was accompanied by a widening of the social class difference.

Breast cancer showed a pattern opposite to that of stomach cancer. In England and Wales in 1931, the SMR for breast cancer was 138 for married women in social class I and 82 for married women in social class V. The low rate in the latter group was probably a product of late age of menarche and early age at the birth of the first child. Restricted food provision delays the age of menarche, and age at birth of the first child is usually later in the upper social classes, as education delays the age of marriage and first pregnancy. Food has become more abundant, and education for women has spread from the upper social classes to become the norm. These processes have resulted in a diminished social class gradient in breast cancer.

Some cancer risks were closely related to class because they were caused by exposures at the work place. For example, before the Second World War, antioxidants based on 1- and 2-naphthylamine were used in the British rubber industry, causing an excess risk for bladder cancer among workers. Use of these antioxidants was abandoned in 1949, and no excess of bladder cancer was found among men who joined the industry after 1949 [3].

These data send two key messages. Firstly, the social class gradient in cancer is not uniform: there are cancer diseases of poverty and cancer diseases of affluence. Secondly, the association between social class and a given cancer disease is not stable over time: the gap between social classes may either widen or diminish over time, depending on changes in living conditions.

[1]SMR, standardized mortality ratio: 100 x the observed number of cancer deaths in a given social class or occupational group divided by the expected number of cancer deaths based on the person–years accumulated by the group, multiplied by the age-specific cancer mortality rates of the background population
SIR, standardized incidence ratio: 100 x the observed number of incident cancer cases in a given social class or occupational group divided by the expected number of incident cancer cases based on the person–years accumulated by the group, multiplied by the age-specific cancer incidence rates of the background population

Current cancer incidence patterns in the Nordic countries

The largest study on cancer incidence, with individual data on social class, causes of death and even incidence, is from the Nordic countries [4]. This study covers 10 million people aged 25–64 years at the 1970 census in Denmark, Finland, Norway and Sweden. The cohort was followed for approximately 20 years, during which time 1 million incident cancer cases occurred. The Nordic countries have a long tradition of high-quality nationwide cancer registration, making it is possible to map socioeconomic differences in the incidence of cancer. As cancer incidence is a better measure of the risk for having cancer than is cancer mortality, incidence is the best measure to use in studying the association between exposure and subsequent risk.

The economic transition to an industrial society occurred relatively late in the Nordic countries. In 1970, more than 20% of men in Finland were still working in agriculture. Table 1 shows cancer incidence rates among men and women in the Nordic countries in 1970–90 for farmers, dentists, waiters, male plumbers and female journalists. These occupational groups were selected to illustrate the cancer patterns by position in society, with differences in income, tasks and habits.

Men in agriculture had a 21% lower overall cancer incidence than men in the general population, the percentage varying from 30% in Denmark to 14% in Finland. Low risks were found for cancer diseases caused by tobacco, alcohol, low physical activity, fatty or abundant food, recreational sun exposure and occupational carcinogens such as asbestos and wood dust. The only excess risk was for lip cancer, known to be common in outdoor workers. Women in agriculture—mostly wives working on the family farm—had a 17% lower overall cancer incidence than women in the general population, the percentage varying from 25% in Denmark to 11% in Sweden. Low risks were found for the same cancer diseases as among men, for cervical cancer associated with having had many sexual partners and for breast cancer associated with late age at birth of first child. The only excess cancer risk among women in agriculture was multiple myeloma, which has also been found in excess in other studies of farmers. Farm work implied hard physical work, a diet based almost entirely on home-grown food, drinking alcohol only for celebrations, tobacco smoking limited to pipe smoking by men and a stable family with two to four children. In 1960, more than 20% of Danish men worked in agriculture, but this percentage had declined to less than 10% by 1980.

The cancer pattern of both male and female waiters was almost the opposite of that of farmers. Waiters had large excess risks for cancers related to alcohol and tobacco use, including cancers of the tongue, mouth, pharynx, oesophagus, liver, larynx, lung, cervix uteri and urinary bladder.

Table 1

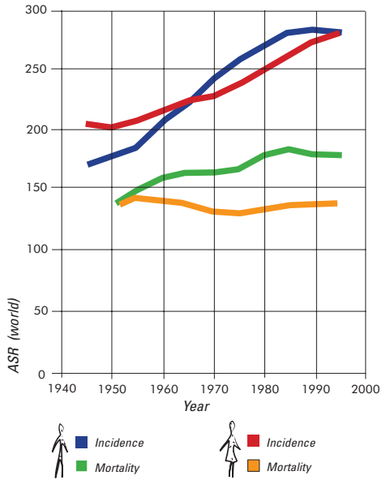
Cancer incidence among men and women in the Nordic countries, 1970–90, for selected occupational groups

Sex	Occupation	SIR for all cancer	Number of cancer site specific SIRs			Cancer sites	
			<100	=100	>100	Low SIR	High SIR
MEN	Farmer	79	21	9	1	Pharynx, tongue, mouth, liver, larynx, oesophagus, lung, colon, rectum, gall bladder, pancreas, nose, pleura, breast, prostate, kidney, bladder, melanoma, other skin, brain, unknown	Lip
	Dentist	97	3	27	1	Pancreas, stomach, lung	Melanoma
	Plumber	108	3	25	3	Lip, testis, melanoma	Pleura, lung, bladder
	Waiter	159	0	19	11		Tongue, pharynx, mouth, oesophagus, liver, larynx, lung, colon, pancreas, prostate, bladder
WOMEN	Farmer	83	15	16	1	Larynx, lung, nose, liver, mouth, bladder, colon, rectum, pancreas, breast, cervix uteri, corpus uteri, melanoma, other skin, non-Hodgkin's lymphoma	Multiple myeloma
	Dentist	108	2	27	3	Bladder, cervix uteri	Melanoma, other skin, breast
	Waiter	106	3	24	5	Corpus uteri, melanoma, other skin	Larynx, mouth, lung, cervix uteri, bladder
	Journalist	122	0	29	3		Lung, corpus, uteri, breast

SIR, standardized incidence ratio

Figure 2

Cancer incidence and mortality in Denmark 1943-1998



Their exposure to tobacco was due both to their own use and to performing hard physical work in smoky rooms.

Plumbers had an excess risk for pleural mesothelioma, showing that their work involved exposure to asbestos used for insulation. Nevertheless, they had a low risk for malignant melanoma, a disease clearly associated in the Nordic countries with frequent vacations in sunny places in the South.

The excess risk for malignant melanoma in both male and female dentists reflects their early uptake of sunny vacations, while they otherwise had a healthy life style, with limited smoking, as seen in their low risks for lung and bladder cancers.

The cancer pattern of female journalists reflects a life involving heavy cigarette smoking and late pregnancy.

Overall, the Nordic data tell us that the cancer pattern of specific occupational or social groups closely reflects its exposure history.

Preventable cancers

A study was conducted in the Nordic countries in 1997 of the proportion of cancers attributable to known and, in principle, avoidable risk factors. The estimate was based on current cancer incidence, the present exposure burden and current knowledge on cancer causes, except for dietary factors [5]. The overall conclusion of this study was that 27% of cancers are in principle avoidable. A comparison of the pattern of work-related cancers in the Nordic countries and the estimated proportion of avoidable cancers showed that in the 1970s and 1980s there was a group for whom this preventive goal was nearly realised: farmers actually had an overall cancer risk 21% lower than that of their fellow countrymen. The same was true for women in agriculture, whose overall cancer risk was 17% lower than that of other women in their respective countries. The goal of prevention as specified for the Nordic countries is thus not unachievable and has already been reached by farmers. Furthermore, the life style of farmers was associated not only with a low cancer incidence but also with low mortality from all causes [6]. Nevertheless, most cancers have a long latency, and the cancer incidence observed among Nordic farmers in the 1970s and 1980s therefore reflected living conditions before the Second World War. Since then, farm work and farm life have changed considerably, as mechanization has replaced much of the previous hard physical work. A recent survey in Denmark showed that obesity is now most common in rural areas.

Cancer incidence increased dramatically during the economic development that followed the Second World War, as illustrated for Denmark in Figure 2 [7]. A decrease in tobacco smoking among men from around 1970 has, however, resulted in decreases in both cancer incidence and cancer mortality trends for men. In coming years, cancer incidence is expected to be heavily influenced by the emerging epidemic of obesity, which is now generally most common among the lower socioeconomic classes. The epidemic will therefore also affect the social gradient in cancer burden. For instance, the occurrence of colo-rectal cancer is related to dietary habits and physical activity. It is interesting that in the 1950s the mortality rate from colo-rectal cancer among 25–64-year-old men in high-income areas in the USA was double the rate in low-income areas, whereas in the 1990s the rate in low-income areas passed that of high-income areas [8]. During those 40 years, therefore, a high-income cancer disease became a low-income cancer disease, as was also seen for lung cancer.

Table 2

Socioeconomic differences

Socioeconomic differences derive from the way the society is organised. Changing these structures is a task beyond the capacity of cancer organisations and other NGOs. But these organisations can fight the inequalities in cancer by working to reduce the cancer burden of high-risk groups.

Measure	Desired outcome
Label and regulate work-place carcinogens	Avoid occupational cancer
Eliminate environmental carcinogens	Avoid environmentally caused cancer
Control food ingredients	Avoid foodborne cancer
Ban tobacco advertising, control alcohol advertising	Avoid cancers due to tobacco and alcohol use, especially among young people
Regulate smoking and drinking public places	Same as above
Provide good, healthy food in e.g., nurseries, day care centres, schools, universities, hospitals, retirement homes	Establish healthy eating habits
Make good, healthy food available in e.g., shopping centres, sports centres, cinemas	Same as above
Improve the attractiveness of e.g., public transport, streets, sidewalks, staircases, bicycle lanes, parks	Make people walk and bike to daily activities like work, schools, shopping
Plant trees, remove garbage, limit noise, ban cars in public spaces	Make walking, playing, jogging, biking attractive as a recreational activity

Fighting inequalities

Fighting against inequalities in the incidence of cancer is not straightforward because the social gradient in cancer is not uniform across cancer diseases and the social gradient in a given cancer disease is not stable over time. Activities that could be undertaken by NGOs are shown in Table 2.

Part of the cancer burden of members of the lower social classes used to be due to exposure to carcinogens at the work place. The fight against occupational carcinogens, as part of the class struggle, has been a fierce one, often demanding 'dead bodies on the table' as evidence. Fortunately, exposure to occupational carcinogens in developed countries has diminished with changes in industry structure and enactment of regulatory measures, although thorough implementation of regulations is still lacking in some European countries. The export of dangerous jobs to developing countries is a bad side-effect of the improved working conditions in developed countries.

Most of the cancer burden, however, is not directly related to exposure at the work place or to other factors that could be addressed easily under the umbrella of the class struggle. Tobacco smoking spread with increasing wealth from persons who could afford it to all layers of society. When the adverse health consequences of tobacco smoking were recognized, the upper social classes were the first to quit smoking. Although tobacco smoking is an individual habit, exposure nevertheless depends on political, economic and social factors [9].

The lesson learnt from the fight against tobacco is that legislative measures, such as restriction of advertising, provision of smoke-free areas and higher taxes are important because they can reach everyone in society. Other measures have to be carefully adapted to maximize their potential to reach all groups. Programmes should be designed to ensure the engagement of all people, irrespective of economic, cultural and ethnic background (see chapter on Evaluating cancer prevention activities). Some success has been achieved, as smoking rates have decreased among men and stabilized among women in a number of western European countries. Not only focused interventions but other social developments probably facilitated this success. Work tasks, work schedules and employment schemes have changed, and a 'smoking break' does not necessarily have the same importance in a self-organized working day in an office as it had on an assembly line. The availability of alternative pleasures, ironically perhaps including fast food, sweets and soft drinks, has increased with the decrease in smoking.

Obesity is the new social epidemic. The sedentary life style started among people who could afford cars and rich food, and the excess risk for obesity-related cancers first appeared among the upper social classes. Obesity is now, however, primarily a burden of the lower social classes, and the social gradient in obesity-related cancers is expected to change, as has already been observed for colorectal cancer in the USA. Although excess food intake and low physical activity are individual choices, political, economic and social factors play an important role, and we now have the concept of living in an 'obesogenic environment' (see chapter on Diet).

It is noteworthy that the lowest cancer incidence in the Nordic countries in the 1970s and 1980s was found among farmers, i.e. among the economically and socially most archaic part of society. It is important to learn from this observation and to see how the healthy assets of their way of life can be adapted to modern living. We must learn more about incorporating physical activity and healthy food, not as additions but as integrated components of daily life. We must find ways of implementing tobacco control for all social groups. We must also learn about the role of social networks and social capital in building and maintaining a social environment with a low cancer burden.

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Theories about change can be used in designing programmes and in measuring their success. Theories about changes in health behaviour tend to look at:

- *cognition: the way people define and think about what they do and how they change their minds in ways that can lead to changing the ways they act; and*
- *context: the cultural, social, physical, emotional and psychological environments that shape people and the factors that can facilitate change.*

No one theory can encapsulate all the factors in health behaviour, but theories can be used to focus on particular aspects of behaviour and to choose the most appropriate programmes for cancer control.

Health behaviour and change

Health behaviour and change

Karen Slama
International Union Against Tuberculosis and Lung Disease, Paris, France

People have always attempted to understand and predict human behaviour. As a large proportion of premature deaths and disability from cancer and other non-communicable diseases are related to modifiable social and individual behaviour, public health workers seek to understand the elements involved in promoting health or health-enhancing behaviour and particularly to understand how and why individuals and social groups change their behaviour. Although knowledge about human behaviour cannot predict the actions of one person, it can provide an understanding of how certain groups of people are likely to act. The identification and accurate measurement of relevant factors can guide practitioners and researchers in the health field in encouraging healthy behaviour.

Although there is a genetic and neurobiological framework for human variability, behaviour and change can be best understood by examining three dimensions—behaviour, cognition and context—and the theoretical approaches to understanding the relationships between them. This chapter is intended to introduce some of the theories behind intervention strategies for change and our evolving sense of their uses and limitations. It is included in this handbook to provide a theoretical underpinning for NGO activities.

Behaviour: what people do

'Behaviour' is the general term covering all the physical acts performed by individuals. Examples of physical acts include walking, interacting with others, writing, reading and preparing to learn. Behaviour includes seeking or not seeking advice for health care and following or not following a prescribed medical regimen. It includes relationships with tobacco, food, alcohol and so on.

Cognition: what and how people think

'Cognition' is the term given to all the mental processes of an individual and includes not only aspects of thinking, such as knowledge, attitudes, motives, attributions and beliefs, but also perceptions, personal values, perceived cultural truths and memory. Cognition can be influenced by intelligence and past experience. Examples are religious convictions, wanting to be a good parent, distrusting modern medicine, knowing that smoking is dangerous for others but believing that it is not dangerous for one's own health, and so on.

Context: the setting of behaviour and cognition

'Context' is a general term that is more inclusive than the general perception of the environment. It includes not only the social, cultural and physical environment but also interpersonal influences on behaviour and the emotional and psychological contexts of each act and cognition. These include laws, norms (socially defined and accepted cognition and behaviour) and social dynamics. Much healthy behaviour is not practised simply because, for instance, it is not defined as necessary by the community (e.g. skin protection), the appropriate choice is not available (e.g. healthy eating at work or school), other forces push society towards an unhealthy alternative (e.g. the tobacco industry) or an unhealthy behaviour is reinforced by contingencies (e.g. pressures of time that reinforce driving rather than walking).

These three dimensions may interact in various ways.

Relationship between cognition and behaviour

The clearest evidence that cognition leads to new behaviour is the development of skills through formal and informal education. Cognition such as beliefs and attitudes can be translated into action if a change is perceived to be possible, if there is no opposition to or difficulty in performing the action or if the cognition is a central component of the person's teleological system, such as religious beliefs [1]. Cognition that is forged from past experience often influences behaviour [2]. For example, a patient who has been successfully treated in the past is likely to return for care when a new illness appears.

Cognitive theories of behaviour attempt to predict what people will do in certain circumstances. The challenge is in identifying which cognition is most salient and the degree to which it can predict change. One of the major hypotheses of most current theories of behavioural change is that a primary determinant of behaviour is an individual's intentions, generally considered to be a function of perceived consequences of change, perceived social influences and emotions [3]. Measurement of intention has supplanted measurement of attitudes in attempts to predict behavioural change [4]. Thus, many people know that they should exercise and eat a healthy diet, and they form an intention: they decide that they will begin to exercise regularly and limit their intake of sweets and fats. If a large proportion of people with this intention do indeed perform these behavioural changes, intention is a good predictor. In many cases, however, behaviour can change thought patterns. In the case of exercise and diet, a person can desire to be healthy but stop working in this direction when he or she finds it difficult to make time to exercise and makes little progress in changing eating patterns. Diet and exercise then become less important. If this is true for many people, intention is not a strong predictor, or the wrong intention has been measured. Indeed, observations of human behaviour indicate that it is easier for people to find reasons for what they do than to change what they do because of what they think [5]. This is the basis of the theory of 'cognitive dissonance', the hypothesis that when a person's behaviour is in conflict with that person's beliefs, the dissonance is psychologically uncomfortable and change will occur to create consonance (agreement) between thoughts and acts. That change occurs at the less resistant site, usually cognition [6].

As this cartoon shows, behaviour can influence cognition.

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Other examples of behaviour influencing changes in cognition include the fact that a person moving into a new social or professional role may not initially adhere to certain ideas, but the very adoption of the new role can lead to changes in thinking. People who move from a state of health to ill-health may change their ideas about health services. Smokers who become non-smokers may find that a number of their perceptions about smoking in public have changed. If there is no external coercion, public agreement with a particular point of view (signing a petition, for example) can act as reinforcement for adhering to that point of view. This is a feature of patient adherence to medical advice [7]. Publicly known behaviour can become a commitment to that behaviour where none previously existed. Making a public commitment to lose weight or to stop smoking is considered a behavioural strategy.

Relationship between context and behaviour

The issue is not just one of cognition and behaviour. Future behaviour is strongly predicted by past behaviour [4]. For example, people who default in their treatment for tuberculosis are more likely to default in re-treatment than people who did not default [8]. Experience and observation of what others do often appear to be more important than cognition in influencing behaviour [9], as has been shown in the social evolution of smoking in a population [10]. Other aspects of context, such as social conditions and government policy, are also strongly related to behaviour and behavioural change. Sometimes, cognition can precede behaviour, and, sometimes, behaviour can precede cognition. Such reciprocity is also found in the relationship between context and behaviour.

Many factors have been identified by epidemiological studies as environmental determinants of behaviour, including employment status and type, income, literacy and educational level, distribution of wealth in the society, and community and health services and their delivery [11]. In cultural and psychological studies, the socio-political situation, coercion, stigma, discrimination and taboos are also recognized as playing a role in behavioural choices (12). The difficulty in defining the role of context in behaviour and change is that individuals vary in the

Source: Jephat Chifamba, Globalink 24/06/03

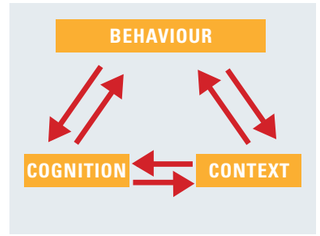
way they interpret and react in a given situation. People choose many of the situations that influence them and even help to create those social situations [13].

The environmental determinants of behaviour influence behaviour directly by limiting access to certain actions as well as via cognition, particularly perception of the choices of behaviour that are available [14]. For example, what a mother considers doing when her child has a high temperature, in the absence of past experience or knowledge, is determined largely by access and interpersonal communication. Behaviour itself can influence the environment; for example, smokers tend to reinforce each other's behaviour, to create or maintain a positive context for smoking [15]. Indeed, research among young people has shown that smokers often resist efforts by their peers to stop smoking [16].

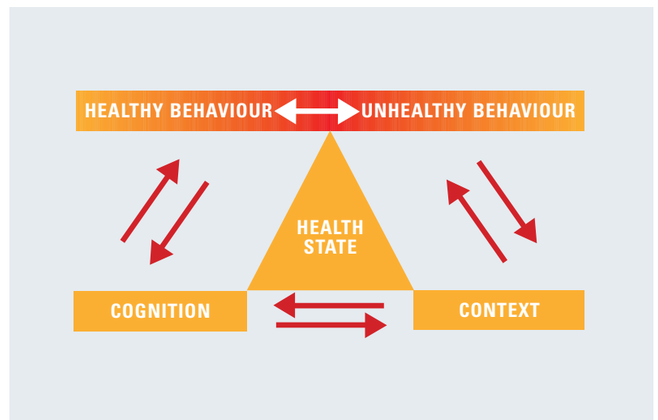
Social learning theory, also called social cognitive theory, based on a combination of cognitive, behavioural and emotional factors, was initially developed in the late 1970s to describe behaviour. It proposes a three-way, dynamic, reciprocal interaction of personal factors, environment and behaviour. In this concept, environment (in the form of interpersonal relations) shapes and maintains behaviour, but people can respond and change their environments [17]. In individual behavioural change therapy based on social learning, an examination is made of the ways the individual understands his or her actions, is rewarded for them and models his or her behaviour on that of 'important others'.

Subsequently, other aspects of the context of behaviour were shown to influence behavioural choices and the possibility of change, including the social and political organization of society.

The relationships between behaviour, cognition and context can be shown as a three-sided triangle, each side influencing the others, shown as follows.



Health state must also be considered in the field of health behaviour. This should be considered to encompass physical functions and the effects of illness, including the adequacy with which stress is addressed by coping strategies [4,18] and phenomena such as addiction and treatment effects. Health state can affect all three elements of the triangle. Its role is central in the conceptual model of determinants of transitions between healthy and unhealthy behaviour, as shown below.



As it is impossible to measure all the potentially important components of any given aspect of health behaviour, theories are used, as long as they prove helpful to understanding and improving the health of individuals, communities and society. Waisbord [19] described theories as "sets of concepts and propositions that articulate relations among variables to explain and predict situations and results. Theories explain the nature and causes of a given problem and provide guidelines for practical interventions." While theories allow consideration of a feasible number of factors, they may not capture the most important elements of cognition or context; furthermore, the degree of importance of each measured element may vary widely between individuals and populations.

The role of theory is to allow the development of hypotheses and the design of programmes and interventions for research. The research should allow for refinement or new theories. Theories and strategies related to health behaviour generally give predominance to the connection between cognition and behaviour or to that between the context and behaviour. The measurements made in each type of theory fall into two main categories. Quantitative measurement involves the assessment of observable, objective behaviour, defined health states and contextual events, or countable scales for subjective variables such as cognition, and the relationships between them. Qualitative measurement involves the assessment of subjective accounts of cultural or social perceptions, which can indicate contextual elements, and the environmental changes required to facilitate alternative behaviour that corresponds to belief structures.

Cognitive theories of health behaviour

Most models of behavioural change are based on an assumption of volitional, that is cognitively determined, behaviour. For example, the health belief model and its offshoots are based on the premise that attitudes and beliefs are the major determinants of health behaviour, and that any behaviour in response to a health threat is based on two major types of cognition: the expectation that a specific action will lead to improved health, and the subjective value that is placed on improved health [4]. Any divergence in behaviour is thus related to the adequacy of cognition and how readily cognition is adapted to new experience. Cognitive theories have been used to investigate the roles of motivation, fear and misperception. In all, the basic premise is the same: preventive behaviour is a function of the perception of threat and of the belief that the best course of action includes new behaviour [20-23]. With the recognition that context also plays a role, evolving theory includes cues to action and general orientation to health as subjective cultural values [24].

Stage models of behaviour have been developed from Rogers' concept that adoption of new behaviour is a process, and diffuses across society from individuals at various stages (diffusion of innovations) [4,19]. Stage models of individual behaviour are based on the hypothesis of interactions between behaviour and cognition, so that different types of cognition operate at different stages. For example, the trans-theoretical model of stages of change proposes that an individual passes through a growing degree of readiness for change before initiating that change [25]. Interventions based on stage models encourage identification of stage, and the cognitions associated with that stage are targeted. In stage theories, intention is considered to be the last step before a new behaviour is practised. Cognitive models generally assume that self-efficacy (the confidence of having the means to enact change) is in operation, and the specific role of the context is added as an aspect of perception of social norms and barriers to action [26].

Social marketing is a strategy that applies the theory of stages by adapting commercial marketing strategies for target audiences, particularly those in the early stages of readiness to change, to influence desire and intention to adopt healthy behaviour [27]. Social marketing strategies are based on the assumption that persistence and long-term perspectives are needed to influence social behaviour and that communication must correspond to the needs and desires of specific target groups, which are ascertained by qualitative measures, such as in focus groups and in-depth interviews [28].

While social marketing involves a stage model of behavioural change, health education is based on the assumption of a more direct line between knowledge and behaviour. Cognitive and motivational approaches are considered important for trend setters who adopt new behaviour and whose behaviour influences the choices of others. This is a necessary background for community commitment for policy and social change [29].

Theories of the context of behaviour

Environmental theories tend to go beyond individual volition and, to varying degrees, discount volition or other cognition. They are based on the premise that, even if attitude mediates a person's responses to a context, it is the environment that influences behavioural choices. A general theory related to context is the 'ecological' approach, in which multiple and reciprocal levels of influence are identified, including intrapersonal or individual factors (biology, psychology and behaviour), interpersonal factors, institutional or organizational factors, community factors and public policy factors [28]. In this perspective, cognitive elements play a relatively small role in health behaviour in relation to context, which is divided into several categories.

In structural models, change in individual behaviour is considered to be a result of changes in the organizational conditions within which the individuals live and work [30]. By changing the structure, change is allowed to occur. The observed decrease in the incidence of stomach cancer has been attributed not to individuals deciding to change their eating patterns, but rather to the quality and variety of foods that have become available with modern refrigeration and food preservation techniques [31]. Research into health-care systems is based on a structural model of behaviour.

In grounded theory, a social and structural model often used in work on sex differences in health, subjective experiences are examined qualitatively to determine the dominant social and structural processes that account for the greatest variation in behaviour in a particular situation, and these become the focus for change [32].

Participatory models are based on the premise that sustained change comes about through social change orchestrated by the community itself [33]. Participatory studies address community programmes that involve the collaboration of various sectors of society for change designated and desired by the community. The North Karelia study in Finland was influential in demonstrating that a community could become involved in social change and that health professionals, political leaders and institutions could work together [34].

Advocacy is a major strategy for social change. It is a systematic attempt to gain political and social support for changes related to health in the population. It does not involve promotion of individual solutions but garners support for changes in the social environment that legitimize or de-legitimize certain behaviour, creating the changes in social conditions that allow individuals to adopt healthy behaviour [35,36]. Social mobilization is an extension of advocacy for changes in social conditions. It emphasizes coalition building to raise awareness and to mobilize the community to demand political action in response to a newly defined

community need [37]. More emphasis is being placed on finding precise indicators for measuring social change and the effectiveness of advocacy and social mobilization, in order to provide a better empirical basis for social measures.

Finding the right mix

Actions related to health behaviour are effective if they strengthen the capacity to exert control over the determinants of health. It is therefore important to identify and measure those determinants. The field of health promotion started with a purely cognitive approach to behaviour, proposing changes in personal behaviour that would result in a healthy population [38]. It became clear, however, that this approach ignored the role of context, and the view was modified over time. Larger social and political processes were seen to facilitate or encourage unhealthy behaviour, and less emphasis was placed on the individual's role in change. Health promotion today is seen as the process of modifying the environment to encourage healthy choices, by using a combination of programmes and interventions, focusing on maintaining health and preventing disease through education, policy and environmental support [39].

Theories and strategies are of value only insofar as they help to produce results. In tobacco control, for example, some people work on changing the legislative context, others try to change perceptions and motivations with regard to tobacco use, and others concentrate on the most effective treatment to help people fight addiction. These are all important, useful approaches, but they are based on different theories for promoting change. Theory is important to avoid wasting resources on ineffective activities to describe, understand or influence the factors related to health behaviour and change. Thus, theories compete to best fit a health problem. Cognitive theories are now more inclusive of contextual elements beyond interpersonal relations, whereas environmental theories often give little importance to the role of cognition. As a general rule, programmes or strategies based on stage theories or social cognitive learning which focus on the cognition–behaviour interaction would appear to be useful in situations in which individuals want to change; and programmes or strategies based on structural theories or community strategies that focus on the context–behaviour interaction appear to be useful when individuals are not specifically motivated for change or do not have options for change. The challenge is to determine when each factor is of sufficient importance in relation to the other. When the context presents barriers to change, interventions on cognition will not suffice, and removing barriers to change will not result in change unless individuals have a reason to do so. Campaigns to encourage jogging in areas where it may be unsafe are unlikely to produce change; however, changing the environment is not usually successful unless the new activity is perceived to be beneficial. For example, provision of free nicotine replacement products to low-income groups will not change their behaviour if there is no desire to quit smoking.

Thus, the strategies available to influence health behaviour are based on diverse theories. An NGO's goal is to channel its efforts in the most effective way, to predict the outcome of its actions in terms of change. Decisions must be based on the validity of the measures for assessing change. Various theoretical approaches are available for different target groups and settings. Well-designed research and informed practice rely on choosing the theory and

Using and evaluating selected theories of change

Theory	Intervention strategies	Process variables	Outcome goals leading to change	Evaluation
Cognitive approaches				
Health beliefs	Access to pertinent, tailored information Health education: persuasion, knowledge transfer strategies	Perceived susceptibility Perceived severity Perceived attainable change in risk Cues to action Perceived social value	Changed perceptions	Changes in knowledge, attitudes, beliefs and practices
Stage models:				
1. Theory of reasoned action	Health education, counselling, innovative media health promotion	Perceived benefits of change and their value Perceived social norms and their importance Intention	Changed perceptions and intention to change	Changes in knowledge, attitudes, beliefs, intention and practices
2. Theory of planned behaviour	Health education, counselling, media health promotion Self-efficacy and motivational strengthening	Perceived benefits and their value Perceived social norms and their importance Perceived behavioural control Perceived barriers Motivation / Intention	Greater confidence and motivation, intention to change	Changes in knowledge, attitudes, self-efficacy, motivation, intention and behaviour
3. Transtheoretical model of change	Tailored advice and information according to stage of readiness Social marketing: fear campaigns, community programmes, communication transfer strategies	Degree of readiness for change by stages: pre-contemplation, contemplation, decision, action, maintenance	Change in degree of readiness Change in attitudes, intention to change	Changes in intention and in behaviour
Contextual approaches				
Grounded theory	Interpretation of subjective analysis of constraints and rules concerning behaviour; advocacy, lobbying	Social and cultural factors	Policy options that change the social and cultural impediments to healthy behaviour	New rules, regulations, policies; social and cultural norms that support healthy behaviour
Participatory theory	Collaborative activities with various sectors Community involvement and adoption of new relationships	Social and cultural factors	Widening circle of stakeholders, common definition of problems	Organizational, regulatory, policy change; population behaviour
Ecological models	Social mobilization Targeted information Social support strategies Measurement, definition and information about sources of environmental constraints Advocacy and lobbying	Intrapersonal Interpersonal Institutional Community Public policy	Changes in environment that facilitate healthy behaviour	New laws and regulations, fewer environmental constraints to healthy behaviour, changes in behaviour in population
Structural models	Analysis of organizational constraints to change Advocacy	Organizational factors	Greater access to healthy behaviour through structural change	New regulations, structure, changes in usage and population behaviour

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conceptual background best adapted to the situation [40].

Nevertheless, focusing on only one aspect of health behaviour is no longer sufficient or viable, as shown by the evolution of health promotion from an individual- to a society-based approach. Theories look at the ways individuals perceive and determine action, or at the way the context shapes the behavioural choices of individuals. To cover a maximum number of possibilities, programmes should include multiple strategies, integrating the goals of changing the context and changing cognition.

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In this chapter we describe why research and evaluation go hand in hand with programme design and implementation and define various types of procedures that NGOs might use for evaluation themselves, or in conjunction with research organizations.

Evaluation procedures, including assessment of needs and evaluation of intervention design, process, impact and outcome, are defined, and examples are presented.

The 'precede–proceed' planning model is described in relation to the design of behavioural change programmes. Surveillance and the importance of cancer registries are also discussed.

Evaluating cancer prevention activities

Evaluating cancer prevention activities

Annie Anderson
Centre for Public Health Nutrition Research,
University of Dundee, Scotland

Many different types of evaluation can be undertaken at various stages of an intervention. Not all the evaluation procedures described here can be carried out by NGOs, but this chapter provides a basic introduction to what might be done. Its aim is to provide a guide for collaborative work with a range of agencies that could help to fund, facilitate or implement evaluation procedures in conjunction with NGOs. In the context of this chapter, 'research' refers to all types of studies that might be undertaken, while 'evaluation' is applied to the various parts or components of a research programme. There is considerable variation in the terms used to describe evaluation procedures, and these are defined (largely with respect to short- and long-term perspectives) throughout this chapter.

Why evaluate

Setting goals and objectives is a key part of the planning and design of screening or intervention programmes. Ideally, research and evaluation procedures tell planning teams whether their goals have been achieved, what processes helped or hindered that achievement and how the results can be maintained, reached or improved. Intervention strategies should be designed hand in hand with evaluation procedures to ensure that, at each stage of the process, relevant evaluation is applied to ensure robust evidence to support continuing and further work. The results of multiple stages of evaluation should be examined to ensure that the intervention is continuing to achieve its goals. Long-term measures of research results alone do not allow insight into processes that occur en route.

Communities, as much as funding bodies, and health professionals have to be reassured that public money is being spent on interventions that are effective in achieving the desired objectives and that those objectives are associated with improved health. Interventions must be based on sound evidence, about both exposure to risk and cancer development (e.g. scientific evidence for a relationship between tobacco smoke and lung cancer) and the methods of intervention (e.g. evidence that interventions are effective in reducing exposure to risks), are cost-effective, are not associated with harm or increased risk and can be implemented practically. The results of interventions should be fed back to communities to provide evidence of action and engender support for further work.

Evaluation of complex interventions (e.g. behavioural) to improve health requires qualitative and quantitative evidence. A phased approach to the design and evaluation of interventions has been proposed [1], involving the theoretical basis (preclinical phase), modelling (Phase I), exploratory trial (Phase II), definitive randomized controlled trial (Phase III) and long-term implementation (Phase IV). The details of designing, reporting and interpreting such trials have been described in considerable detail [2] and highlight the complexity of the issues, skills and resources needed for comprehensive evaluation. The 'gold standard' design for testing the effectiveness of an intervention is the randomized controlled trial, which involves randomization to allow comparisons of treatments without prejudice from the participants (whether conscious or not) and 'blinding', which reduces bias on the part of both participants and researchers after the assignment of participants to a group. Unfortunately, many trials of behavioural interventions cannot achieve randomization, as some participants will not agree to partake in certain interventions, placebos can be difficult to identify (especially in dietary trials), blinding is challenging (e.g. for physical activity interventions), and doses of effective intervention (e.g. amount and duration) cannot always be identified. Many other types of research are, however, appropriate or can be complementary to the randomized controlled trial design. This is an important consideration when examining the transferability of results from a research setting to everyday practice and the context within which an intervention will be implemented.

Local evaluation is as important as national or other large-scale assessments. Local work should mainly address planned and ongoing interventions. It should be designed primarily in relation to local needs, to assess local efforts. In addition, standardized formats of evaluation allow construction of a national picture and adaptation of shared findings for the benefit of the wider community.

Monitoring of changes in health and disease is generally beyond the remit of small community projects [3]. Monitoring alterations in behaviour (e.g. changes in fruit and vegetable consumption) requires adequate, representative samples and, ideally, a control population, in order to exclude effects due to current changes. Results can also be used to provide feedback to the population and to support the need for separate, more robust research.

Types of evaluation

'Evaluation' has been defined as the systematic collection of information for the assessment of programmes [4]. Means and issues for assessing the effectiveness of health programmes, such as health communication, have been described in detail by the National Cancer Institute (USA) [5]. The key issues in evaluation are:

- Have the programme objectives been met?
- Were the changes that occurred the result of the programme?
- How well was each stage of progamme planning, implementation and assessment handled?

A range of types of evaluation is available to predict the results of a programme, measure its results or help determine why certain results are seen [6]. Many different terms are used, and the nomenclature may vary, but the key evaluation approaches are as follows:

Needs assessment and evaluation of intervention design

The initial stage of designing an intervention involves making a needs assessment. This can cover many aspects, including a measure of the disease burden in a population, identifying the needs perceived by the population (e.g. access to opportunities for physical activity, restrictions on local alcohol sales), needs perceived by professionals (e.g. screening facilities and equipment) and information needs (e.g. whether the population already knows about healthy eating and how such messages can be communicated practically). Intervention design is usually evaluated when the goal of the programme is known but the process and routes of achieving the objectives are not yet defined.

Thus, programme design should be evidence-based, combining published intervention strategies with local needs based on an appreciation of cultural and socioeconomic background, and should include evidence that the intervention strategies are appropriate for achieving the declared objectives and identify indicators for later evaluation. At this stage, it is common to use formative research data to design a pilot project, which allows implementation of an intervention and its assessment by process evaluation. If the intervention programme includes health communication, formative research should include pre-testing of materials.

The following methods are appropriate for obtaining the views of the user community on the intended activities:

- self administered questionnaire (e.g. to obtain individual reactions to proposed work);
- individual interviews (e.g. to ascertain individual responses and beliefs and to discuss issues);
- focus group interviews (e.g. to obtain in-depth information about beliefs and perceptions);
- theatre testing (e.g. to test respondents' views on audio-visual materials); and
- readability tests (e.g. to assess reading comprehension).

Other qualitative approaches that may be used include structured and unstructured in-depth interviews with individuals and focus groups, observations [7], case histories, analyses of documents and visual material, interviewing and analysis of data from diaries and other sources.

Process evaluation

The assessment of process, which can also be described as monitoring, involves understanding and tracking the processes used to implement the intervention programme [4]. It is useful to provide evidence for the progression of the programme, to encourage the participants and to help ensure that the programme is evolving as foreseen. It should be done before impact evaluation. Process evaluation often relies on the collection of qualitative data. Quantitative measures are also used, covering:

- work performed, time schedules and expenditures;
- staff involved (rank, number);
- enquiries and responses;
- frequency of delivery and contact;
- numbers of individuals receiving intervention;
- costs of programme; and
- quality of intervention as perceived by users.

Example of formative research

To develop targeted skin cancer prevention programmes for children in multi-ethnic Hawaii [6]

Aim	To understand current practices, beliefs, social norms and environments in relation to skin cancer prevention.
Methods	Group discussions, interviews with 216 children, 15 parents and 27 recreation staff; quantitative and qualitative analysis.
Results	Children were reluctant to dress in a specified manner and did not understand what skin cancer was. Parents and staff were enthusiastic that education and policy support would improve their own and their children's habits.
Conclusions	(for use in developing intervention) Gradual change should be promoted, with environmental support provided and parents and staff being involved.

Impact evaluation

Impact assessment is evaluation of the short-term effect of an intervention on the objectives. The importance of setting SMART (specific, measurable, achievable, realistic and time bound) programme objectives is crucial to programme development and subsequent evaluation. Most community intervention programmes are designed to change health through intermediate outcomes, e.g., to increase fruit and vegetable consumption by increasing awareness of the message, increasing perceived affordability and increasing access and availability.

Example of process evaluation

Implementing dietary intervention in primary care practice [8]

Aim	To examine the feasibility of enlisting primary care physicians to implement a dietary intervention.
Methods	Group physicians introduced a self-help booklet to promote dietary change at routine appointments. Delivery of the booklet was recorded at the time of the appointment; recipients were contacted 3 months later to ask whether they had received and used the booklet. Discussions and interviews with 216 children, 15 parents and 27 recreation staff. Quantitative and qualitative analysis.
Results	96% of participants responded; 93% remembered reading part of the booklet and had been more likely to read it with increasing time spent discussing it.
Conclusions	The primary care setting can be used to deliver interventions to change diet. Training a health team and repeating the dietary advice at subsequent visits might increase the success.

Example of impact evaluation

Randomized controlled trial of primary school-based intervention to reduce risk factors for obesity [14]

Aim	To assess whether a school-based intervention was effective in reducing risk factors for obesity.
Methods	The intervention was assessed on the basis of measures of growth (actual height and weight), diet (24-hour recall), physical activity and sedentary behaviour (questionnaire), psychological status (questionnaires on self-perception, dietary restraint, body shape perception), and knowledge and attitudes (focus groups and scoring for groups of children).
Results	Changes in vegetable consumption, sedentary behaviour and global self-worth were noted between intervention and control groups and by weight.
Conclusions	The programme brought about changes at school level (e.g. improved the environment for changes in behaviour and altered the school 'ethos') but had little effect on the children's behaviour.

The methods of assessment tend to be quantitative [9] and usually involve collecting information from a large number of people to obtain numerical data, which are analysed. The methods include questionnaires, interviews, food diaries and sales data [10]. Valid, reliable measurement instruments are essential, and these have been described elsewhere [11–13].

Information that can be derived from an impact evaluation includes [3]:

- changes in knowledge and attitude;
- short-term or immediate changes in behaviour; and
- policy or other institutional changes

Example of outcome evaluation

Effect of community-wide prevention of cardiovascular disease on cancer mortality rates [16]

Aim	To examine the long-term trends in cancer mortality rates after the North Karelia intervention programme
Methods	Age-adjusted mortality calculated for male population. aged 35–64 years in North Karelia during 1969–91. General linear models used for analysis.
Results	During the 20-year study period, the cancer mortality rate decreased by 45.5% in North Karelia and by 32.7% in all of Finland.
Conclusions	The results support the hypothesis that programmes to reduce the risk for cardiovascular disease can lead to beneficial changes in mortality from cancer, although such changes take longer to manifest.

Outcome evaluation

The 'outcome' is the total long-term effect on the aim of the programme (actual health behaviour, e.g., long-term maintenance of desired behaviour) of all work within an intervention [15]. Outcome evaluation can also be seen as determining the effect of the intervention on indicators of health and quality of life. Ideally, health behaviour research includes an independent (bio) marker of behaviour in order to demonstrate change rather than reported behaviour. For practical reasons, biomarkers are usually used only for sub-samples, for example, measurements of urinary cotinine to assess smoking behaviour.

One of the limitations of outcome evaluation (and complex interventions in general) is the inability to control for factors associated with the immediate intervention which might influence the results. For example, national campaigns by vested interests or policy implementation on taxation might have a greater influence on behaviour than local action. Other examples include employee strikes, weather conditions, influenza epidemics and transport problems: all have effects for certain periods, which must be considered in evaluations.

Information obtained from an outcome evaluation might include changes in:

- morbidity and mortality;
- tumour size;
- exposure to risk factors; and
- rates of recidivism.

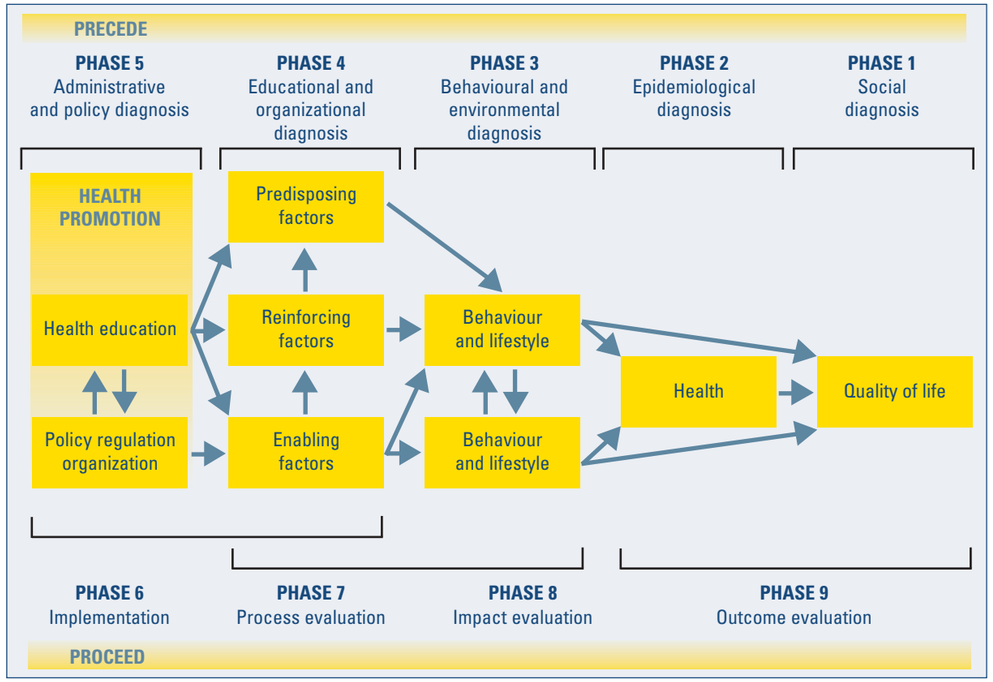
Ideally, any intervention should be assessed comprehensively for its effect on changing health (or health behaviour) in both positive and negative directions, and possible side-effects should be considered, as well as the major health outcomes.

Planning evaluation

The 'precede–proceed' planning model for behavioural change [17] seeks to give individuals the understanding, motivation, skills and active engagement in community affairs necessary to improve their quality of life. The model includes predisposing, enabling and reinforcing factors within communities and the environment. The model has nine phases, the first of which is social diagnosis of self-determined needs, wants, resources and barriers in target communities, which can be identified through formative research and issues relating to quality of life. Other phases that allow planning of implementation are:

- epidemiological diagnosis;
- behavioural and environmental diagnosis;
- educational and organizational diagnosis; and
- administrative and policy diagnosis.

Figure 1. 'Precede–proceed' planning model



Source: Green and Kreuter [17]

These early stages of planning should influence the design and implementation of the intervention, which in turn is associated with evaluation procedures, as illustrated in Figure 1.

The elements of an evaluation design proposed by the National Cancer Institute (USA) [5] are as follows:

- clearly defined objectives,
- definition of data to be collected (in relation to the objectives),
- method (design that will allow valid, reliable measurement),
- identification of collection instruments,
- data collection procedures (protocol),
- data processing (how will the data be prepared for analysis) and
- data analysis (statistical techniques).

Evaluation and monitoring (ongoing collection of data) are effective means of obtaining information about the work of heath personnel, community involvement in prevention programmes, community knowledge about disease risk and behavioural change. These data can provide support for programmes for changing health behaviour and reducing exposure to risk factors. In a national programme, health outcomes are expressed as morbidity and mortality and can be measured effectively only by surveillance.

Surveillance

Surveillance has been defined as the systematic collection, analysis and interpretation of data on specific outcomes and impacts for use in the planning, implementation and evaluation of public health practice [18].
In relation to cancer, reliable estimation of the number of new cases (incidence) and of deaths from the disease (mortality) requires population-based cancer registration. Compilation of worldwide, age-standardized cancer rates allows the identification of regions where particular tumour types are most prevalent and provides a basis for research on cancer causes and prevention. Cancer registries can also provide data on prevalence, methods of diagnosis, stage distribution, treatment patterns and survival [19].

A conceptual framework of public health surveillance [20] and action includes eight core and four support activities, measured from indicators. Although these actions are designed particularly for infectious diseases, they are also relevant for non-communicable diseases. The core actions in surveillance are detection, registration, reporting, confirmation, analysis and feedback. In surveillance for behavioural change, the relevant measures of activity include knowledge about levels of risk, attitudes, intention, behaviour and exposure.
Identifying data on the incidence of and mortality from particular cancers is crucial in health surveillance planning, and relevant risk factors must be used as feedback for the design of intervention programmes [21].

Mathematical models have been used to quantify the effects of preventive measures [22], which take into account indices of effectiveness, the time course of risk reduction and possible confounding factors. Typically, the measures of success in an intervention programme are cancer incidence or mortality, adverse reactions (e.g. health or economic) and quality of life [23].

Surveillance must be related to policy and programme implementation, with programmes designed in response to the available data.

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Tobacco use is a major source of illness and premature death. Using tobacco creates physical and psychological dependence, but it is also a social behaviour that is influenced by tobacco control measures and changing social norms associated with tobacco use over time.

NGOs can play an important role in accelerating the transition towards a non-smoking society in all major areas of action: public awareness and values, protection of smokers and non-smokers, prevention of uptake of tobacco use and cessation programmes.

Advocacy is an important strategy for influencing regulatory and legislative measures and for garnering public support for those measures. Advocacy and information can fight the influence and power of the tobacco industry.

Effective programmes can help individuals not to start or to stop using tobacco. Tobacco control demands competent, well-trained staff who have time, funding and resources. If a cancer society wants to prevent cancer in the population, it must include tobacco control among its major activities and staffing priorities.

Tobacco control

Tobacco control

Karen Slama
International Union Against Tuberculosis and Lung Disease, Paris, France

Tobacco and cancer: the disease burden

Approximately 35% of deaths of men and 13% of those of women aged 35–69 in developed countries are due to tobacco use [1]. Tobacco use currently accounts for 16% of the annual incidence of all cancer cases and 30% of cancer deaths in these countries [2]. The other principal fatal diseases caused by tobacco include those of the cardiovascular and cerebrovascular systems and the respiratory tract. Recent estimates by the World Health organization (WHO) [3] attribute one-sixth of all deaths in developed countries to tobacco use. By 2020, one in three deaths of adults in the world is expected to be due to smoking [4].

Tobacco use or passive smoking (also known as exposure to second-hand smoke, environmental tobacco smoke or smoke from others' use) threatens the attainment of the non-smoker's life expectancy and severely diminishes the attainment of a healthy lifespan [5].

The evidence for the relationship between tobacco use and cancer continues to evolve, although there are differences in interpretation. Tobacco smoking has been reported to be causally related to deaths from cancers of the oral cavity, oesophagus, pharynx, larynx, lung, pancreas and bladder [6]. Other cancers that have been weakly related to tobacco use include those of the stomach, kidney, liver, nasal cavity, nasopharynx and lip and myeloid leukaemia [7]. The relationship between cervical cancer and tobacco use is difficult to determine; however, the monograph on carcinogenic risks from tobacco published in 2002 by the International Agency for Research on Cancer (IARC) reported that there was sufficient evidence of a causal link between smoking and cancers at all of the above sites, including the cervix [3].

Getting them coming and going: Sources of revenue from smokers

In 2000, Philip Morris International congratulated the Czech Republic on having saved US$ 27 million in 1999 'from reduced health care costs, savings on pensions and housing costs for the elderly—all related to the early mortality of smokers.' Arthur D. Little International, Inc. Philip Morris Czech Republic Study 'Public Finance Balance of Smoking in the Czech Republic.' Source: American Legacy Press

Japan Tobacco International is looking for another source of revenue from smokers. It has bought the marketing rights to a lung cancer vaccine being developed. Helen Wallace of Genewatch commented: "Giving a tobacco company exclusive rights to a lung cancer vaccine is like putting Dracula in charge of a blood bank." Source: Boseley S. Tobacco firm to profit from cancer genes. The Guardian Newspapers Limited. 27 Feb. 2002 at http://www.guardian.co.uk/business/story/0,3604,591946,00.html

The risk due to exposure to exhaled and sidestream smoke from others' smoking (passive smoking) is lower than that due to active inhalation of mainstream tobacco smoke, yet it is an important avoidable risk.

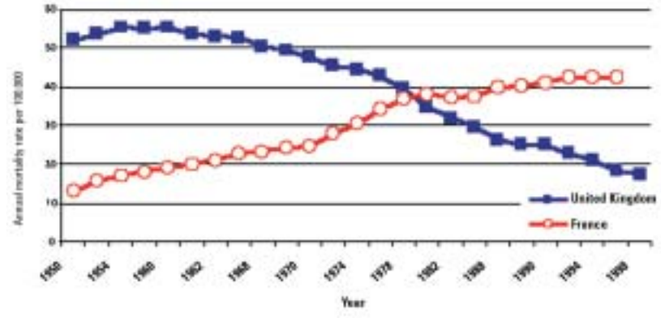
Occupational exposure to tobacco smoke was considered by a working group convened by IARC to be a 'Group 1 carcinogen' (see chapter on Occupational exposures). Wells [8] suggested that the different risks associated with active and passive smoking indicate different susceptibilities: the risk for cancer is so high for smokers that the victims include smokers of average susceptibility, whereas the victims of passive smoking are those who are most susceptible. Passive smoking is associated with excess risks for cancers at a number of sites, but these are not consistently the same as those associated with active smoking. Cancers that have been associated with both active and passive smoking appear to be those of the lung, liver, cervix and nasal sinus and leukaemia; other cancers that are associated with active smoking have not been linked to passive smoking [8,9]. Passive smoking has been found to be associated with cancers that are not related to active smoking, including those of the brain, endocrine glands and breast and lymphoma [8,10]. The IARC monograph took the position that the evidence is sufficient to conclude that passive smoking is a cause of lung cancer in people who have never smoked but that there is not enough evidence for associations with other cancer sites. It concluded that it is unlikely that a relationship exists with passive smoking that does not exist with active smoking [3].

There are benefits of cessation at all ages. The risks to the cardiovascular system begin to decrease rapidly, while the risks for cancer and respiratory disease decrease more slowly and do not attain the levels of people who have never smoked [11,12]. Smokers who have already developed cancer may benefit from stopping smoking [13], but the best course is never to smoke and not to be exposed to others' smoke.

The individual costs for smokers in respect of ill-health and premature death are high. Half of the smokers who die from tobacco use do so in middle age, losing an estimated 20–25 years of life when compared with non-smokers [1]. The costs to society vary according to their social and health care systems. In the United Kingdom, for example, the cost of tobacco use to each health authority region of 500,000 people (with 27% smokers) has been estimated at £14 million, with an additional £1.3 million for households in which children are exposed to other people's tobacco smoke [14]. The total gross cost of treating diseases attributable to smoking in high-income countries is estimated to be between 0.1% and 1.1% of the gross domestic product, depending on the proportion spent on health care costs [15].

Evolution of lung cancer death rates among men aged 35-54 years, France and United Kingdom, 1950- 1998

The prevalence of smoking among men was higher in the United Kingdom than in France in the early twentieth century, and this was reflected in the rates of lung cancer measured in the 1950s and 1960s. By 1970, fewer men in the United Kingdom than in France smoked, and this was reflected in decreasing lung cancer rates among the former. In France, the rate of smoking among men remained at least 10 points higher than that among men in the United Kingdom until the late 1990s.



Source: Peto et al [1]

Population and individual factors in tobacco-related behaviour

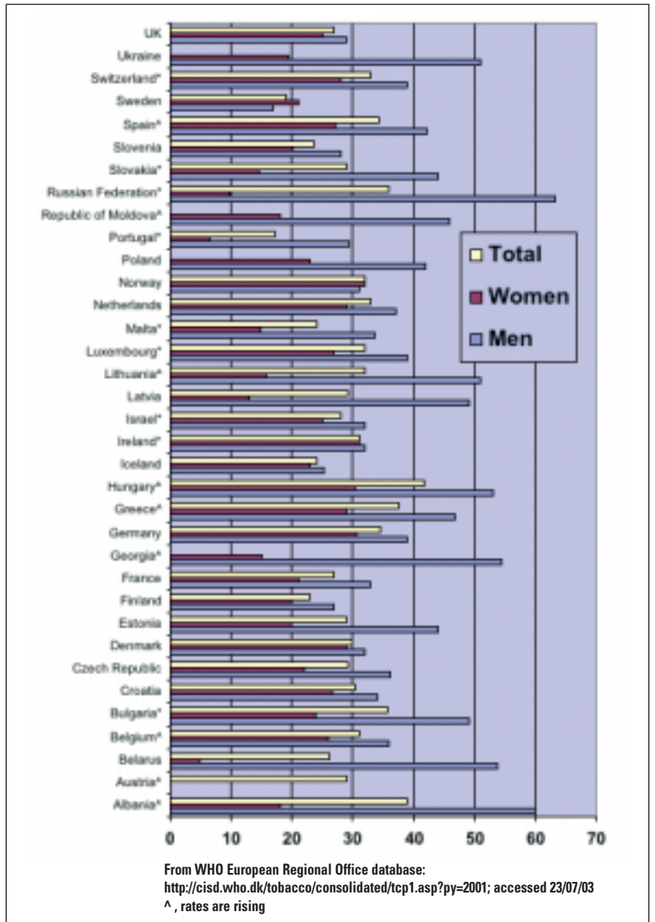
The key population and individual factors related to smoking and cessation are described below.

Demographic factors

Men appear to be more likely to have a higher overall prevalence of tobacco use and greater daily consumption than women [16]. In Europe, the rate of smoking among women increased after that of men with a lag of 20 years or more. In addition, the peak rates among women in industrialized countries seem to remain stable longer than those of men [17–19]. In societies in which smoking rates are still increasing or are at a peak, much higher rates are found among younger people. In societies in which the rates are clearly declining overall, the prevalence tends to be similar in most age groups [20]. Among doctors in Minnesota (USA) in 1993, the proportion of smokers among practising physicians was lowest in the youngest age group [21].

Figure 1

Prevalence of smoking in Europe, 1999–2001 or 1994–98*



From WHO European Regional Office database: http://cisd.who.dk/tobacco/consolidated/tcp1.asp?py=2001; accessed 23/07/03
^, rates are rising

Differences in smoking rates according to educational achievement have differed over time [22–24], and, as smoking evolves, the habit tends to concentrate in poorer groups [25–27]. Thus, the highest prevalence of use and the greatest burden of disease are increasingly borne by people with the least income and education [28]. Poverty itself is not a cause of smoking, and the poor do not smoke more than the rich in every country. Instead, the influence of education and access to information appear to be relevant predictors of tobacco use [29]. Cessation rates are greatly influenced by social class, and evidence is accumulating that factors such as less awareness about health risks [30], a less supportive social environment [31] and stronger addiction [32] are important impediments to cessation in socially deprived groups.

Social norms

A major factor in the opening of the female market for cigarettes in the USA was a diminution of the taboo on smoking in public [33]. Restrictions on smoking in public appear to play an effective role in campaigns for cessation [34]. As smoking becomes a less acceptable social option, public tolerance for it appears to decrease [35–37]. This may reflect growing awareness of the business tactics of the tobacco industry, as well as changes in opinion about the importance and urgency of reducing the health burden due to tobacco use.

Behaviour related to price, smoking restrictions and other factors

Consumption decreases with increased tobacco taxation [38]. Time–analysis studies have shown a global impact of the combination of widespread information about tobacco, total bans on advertising and restrictions on smoking in public places [39]. These social measures build and reinforce decisions to stop or not to start smoking and provide a base for education and intervention campaigns for smokers. But socially motivated attitudes can only facilitate individuals' behaviour. One motivation for stopping smoking is the perception that the personal risks are greater than the benefits [40]. The variation in the proportion of the population that is ready to stop smoking [41] has been hypothesized to correspond to the level of tobacco control [42].

Results of effective interventions

Tobacco use is more than an individual's free choice to smoke or not to smoke. Smoking is a social behaviour and is the concern not only to health sciences, which measure its medical and social costs, but also to political, commercial, financial, historical and cultural elements. Tobacco manufacturers form a powerful industry that actively promotes smoking and social approval of smoking as a reasonable, normal behaviour associated with acceptable risk.

Litigation in the United States opened internal tobacco industry documents to public scrutiny. These documents demonstrate that tobacco companies have known of the harmful effects of their products for more than 50 years, that they willingly seek children as loyal customers, that they manipulate the addictive potential of their products, that they unleash their full power to block or counter health initiatives that impinge on their profits.

A 1994 British American Tobacco primer for employees, 'Smoking Issues-Claims and Responses', proposes this response to the claim that smoking causes lung cancer:

"There is still a controversy about smoking and health. Although there is a 'statistical association' between smoking and lung cancer, which means that smokers are more likely to develop lung cancer than non-smokers, smoking has not been proven to actually cause lung cancer… (I)f smoking causes lung cancer, why do the vast majority of smokers not develop lung cancer, and why do non-smokers develop it? These are questions to which science has not provided answers."

Source URL: http://tobaccodocuments.org/landman/2504094459-4497.html

PDF: http://tobaccodocuments.org/landman/2504094459-4497.pdf

It has been important to deny causality between tobacco use and disease both to maintain client confidence and to avoid charges of criminal endangerment or fraud. After all, in 1972, James Bowling, a vice-president of Philip Morris, told the public, "If our product is harmful, we'll stop making it." (quoted in Ciresi MV, Walburn RB, Sutton TD. Decades of deceit: Document discovery in the Minnesota Tobacco Litigation. *William Mitchel Law Review* 1999;25:477–566).

One of the tobacco industry's major concerns about the public response to tobacco has been the development of clean air policies and lower social approval of smoking. An internal document from Philip Morris (Altria Group) reveals corporate strategies to reverse the decline in social acceptability of smoking in Europe. The following quotes come from the Philip Morris Corporate Affairs Europe 'Smoking Restrictions 3 Year Plan 1994–1996':

"Working with the media is key to maintaining the social acceptability of smoking. Europeans believe that Americans tend to be fanatical extremists went [sic] it comes to public health issues. We shall take this opportunity to use US-sourced 'ETS excess stories' (dismissal from work over smoking, career discrimination due to smoking, etc.) to help discredit all anti-smoking initiatives—American as well as European. The Plan calls for using libertarian groups (e.g., Social Affairs Unit, Arise) whenever possible to communicate this message;

"In order to maintain a favorable social environment and to promote smoking as a custom still socially acceptable in Europe versus the US, Philip Morris will develop in appropriate markets courtesy/tolerance campaigns… The campaigns should seek … ultimately, (to) reduce pressure for any legislative action."

Source URL: http://tobaccodocuments.org/landman/2501341376-1388.html

PDF: http://tobaccodocuments.org/landman/2501341376-1388.pdf

Some organizations may be reticent about using the full arsenal of effective tobacco control, limiting their activity to providing specialized health education or prevention programmes, perhaps to avoid any semblance of moralizing or 'marginalizing' smokers. Nevertheless, evidence is accumulating that the most effective cancer control in relation to tobacco use derives from a combination of measures that affect smoking behaviour or prevent uptake at the population level [39,43–45]. Because the effects of these measures are a result of synergy between comprehensive, multiple factors, including advocacy, the independent effects of which are impossible to measure, it is misleading to quantify efficacy other than from trends over time in prevalence, changes in social values (as measured by attitudes and support for tobacco control measures) and cancer mortality rates [13,35,46]. Tobacco control actions that result in small reductions in risk in large populations will be more effective in reducing the rates of death and disability than actions that result in larger reductions in risk in small populations [47].

The maximum overall impact of the combined actions of governments and civil society in some countries in bringing about steady annual decreases in the national prevalence of tobacco use appears to be about 2% - in the United States, the rate is about 0.5% - with declining rates of tobacco consumption [48,49]. The estimated potential efficacy of each of the methods that is regularly included as a key tobacco control activity is much higher, but because these measures are generally under-applied and because of countermeasures taken by supporters of a pro-tobacco environment, progress for public health can be measured only in long-term changes.

The search for medical progress in secondary prevention of cancers through new techniques for early cancer detection continues. Nevertheless, the potential public health gains to be derived from current procedures for lung cancer screening are minimal in comparison with effective reduction of the number of people who use tobacco.

Table 1

Strategies and goals of tobacco control

Characteristic	Policy goal				
	Improve health	Protect children	Protect non-smokers	Inform adults	Reduce health inequalities
Taxes	•••	•••	•	•	•••
Research	••	•	••	•••	•
Mass information	••	••	••	••	••
Advertising bans	••	•••	•	••	••
Clean air	••	•	•••	•	•
Deregulation of nicotine replacement therapy	•	••	-	-	•
Control of smuggling	•	••	-	-	•

Source : Jha et al. [50]

Methods and characteristics of effective tobacco control

Major elements of tobacco control

The key elements can be grouped in several ways. A number of investigations by economists have shown that tobacco control is most influenced by six major demand characteristics and one supply characteristic [50], classified by strength of effect according to desired outcome (policy goal) as shown in Table 1.

A different approach to the evidence is that of another economist, Joy Townsend, who described the five key elements and their relative influence on decreases in the prevalence of smoking in the United Kingdom [51]. These elements are regularly increased taxes, clean air policy, health education, bans on tobacco advertising and promotion. The fifth element concerns cessation, not the availability of nicotine replacement therapy, but rather the opportunistic provision by general practitioners of brief advice about stopping smoking to all of their patients who smoke.

Types of tobacco control strategies

The report of the Surgeon General (USA) for 2000 [13] suggested that interventions can be classified as educational, clinical, regulatory, economic and social. WHO [43] combined these differently and included civil actions within the major principles of health information and advertising bans, taxes and regulations (clean air, product contents and packaging), smoking cessation activities and tobacco control coalitions for effective advocacy. The first two principles imply direct governmental action, while the next two include individual and NGO activities. But the key elements of tobacco control should be reflected in the entire range of NGO activities.

Areas of tobacco control

Examination of tobacco control programmes in countries with advanced activity [44,52–56] indicates that an effective tobacco control programme contains elements covering: public awareness and values, protection, prevention and cessation. Although some strategies cut across these areas, no single component is sufficient alone [35].

(i) Public awareness and values: Ultimately, the strength of tobacco control derives from the public response to tobacco use. If public opinion and social norms give little value to tobacco use, its appeal will wane and both prevention and cessation are more successful. All the techniques of tobacco control are direct or indirect pathways towards social and legal frameworks that discourage tobacco use in all social groups. In some countries, the social value of tobacco use is high, and tobacco control initiatives are not given credibility.

A health message:

We now know how many cigarettes it takes to start lung cancer.

One. But we don't know which one (and neither will you).

From the Australia National Tobacco Campaign

'Every cigarette is doing you damage'

Source: http://roswell.tobaccodocuments.org/polllay/images/Mar44.17_display.jpg

(ii) Protection: As tobacco use causes tremendous harm, immediate steps must be taken to protect smokers and non-smokers alike. Regulation of products and access has proven to be difficult. Litigation for consumer deception and other marketing abuses by the tobacco industry is beginning to achieve redress for harm and to assure constitutional rights. In some countries, public protection against involuntary exposure to cigarette smoke has been obtained. In many countries, however, existing laws are only loosely enforced. Other issues, such as the protection of workers involved in the growing, curing, processing or selling of tobacco, are important when general standards of protection for workers are not well established. International issues of protection, including trade practices, smuggling, subsidized tobacco products and duty-free sales, can be legislated nationally but must also be the subject of international agreements.

(iii) Prevention: It is in the nature of society to pass on its beliefs and values from one generation to the next. Societies are, however, in flux to varying degrees, and the beliefs and values of the past are not always maintained. The tobacco industry has a successful record of facilitating changes in attitudes towards smoking, towards the age of starting smoking and towards the acceptance of smoking by women [57]. Cultural and religious tenets that discourage smoking have been weakened. Nevertheless, prevention is still underpinned by the passing-on of beliefs and values between generations. In industrialized countries, prevention occurs if society disapproves of tobacco use among both adults and children. Attempting to prevent the uptake of tobacco use by children while remaining silent about its use among adults has not been effective [58].

(iv) Cessation: Even in times most favourable to smoking, some people want to stop using tobacco. Tobacco is addictive due to the effects of nicotine on the central nervous system. Like any addiction, that to nicotine is a complex mix of pharmacological effects on the body and the perceptions and attributions of the individual to the effects and to the act of smoking. There is variation not only in individual responses to the challenge of breaking an addiction but also in the efforts required by the same individual to quit at different attempts. Nevertheless, there are some constants in tobacco cessation.

Cessation is a lengthy, demanding and often difficult process. The relapse rate is high; in the USA, only about 6% of people who try to quit smoking at any time are successful for more than 1 month [13]. The curve for successful abstinence after quitting smoking descends rapidly during the first month after cessation and decreases at a slower rate over the next months and years [59,63]. Each cessation attempt can, however, be a learning experience on the road to eventual cessation.

The environment has a strong impact on the number of people who try and succeed in stopping smoking: the more people around a smoker who are stopping the greater his or her chance of successful quitting also. The results are better, and larger proportions of the population make the attempt [60].

The effectiveness has been proven of behavioural and pharmacological aids (currently, nicotine replacement products and bupropion; other medications are being tested) for helping people to break their addiction to tobacco, and specialist cessation programmes based on proven treatments have consistently shown better cessation rates than placebos [61,62].

Missing information and research topics

Despite the damage that tobacco use causes, basic information is missing. We are only beginning to understand the powerful addictive effects of nicotine. We know very little about the role of additives or tars in physiological or psychological reinforcement of smoking. We do not know if the public would benefit from product regulation that either lowers nicotine yield or raises it per tar yield.

We need better understanding of the personal, physical and social dynamics of initiation, maintenance and cessation. Little success has been achieved in dissuading young people from starting smoking. Combined approaches to reducing tobacco use at the population level produce a drop of at most only a few percentage points in prevalence rates. Most tobacco users are not motivated to stop soon, and better health promotion is needed. When smokers ask for help, the best treatment, combining medications with cognitive–behavioural strategies for change, rarely reach 30% long-term success and usually much less. We are almost helpless in aiding young people to stop.

With the current low rates of cessation, new initiatives for harm reduction are being examined. We do not know which markers could provide a real estimate of reduced risk; we do not know the relative effects on health of verified long-term reduction in consumption or the results of introducing new, potentially less harmful products on population behaviour and long-term public health outcomes.

We need innovative research at pharmacological, bio-behavioural, medical, epidemiological, psychological, interpersonal, political, economic, commercial and cultural levels concerning tobacco use. We must develop better ways of measuring the effects of advocacy and health promotion. We urgently need better understanding of the barriers to individual and population change, so as to devise better programmes for smoking cessation. We need research into diffusion and health policy to understand the slow response to information about deaths due to tobacco and to the role of the tobacco industry. We need to understand and predict the strategies of the tobacco industry to more effectively combat it, by looking at local and international laws and international trade. We need to monitor and reinforce appropriate national responses to WHO's International Framework Convention on Tobacco Control.

WHO Framework Convention on Tobacco Control (FCTC)

At the World Health Assembly in May 2003, 192 nations approved the text of the world's first health treaty, the WHO Framework Convention on Tobacco Control (FCTC). A minimum of 40 nations must ratify the treaty for it to enter into effect. As of 20 June 2003, 40 nations1 had signed it. Signing the treaty is not a legally binding step but an indication that the country intends to undertake a careful examination of the treaty in good faith. Ratification indicates agreement to undertake the relevant treaty obligations. Once a country has ratified the treaty, it becomes an official Member State of that treaty. Ninety days after 40 countries have ratified the treaty, it formally becomes international law. The treaty will regulate relations only between countries that have ratified it (see FCTC Procedural Outline http://www.fctc.org).

Part II, Article 3 of the FCTC[2]

Objective

The objective of this Convention and its protocols is to protect present and future generations from the devastating health, social, environmental and economic consequences of tobacco consumption and exposure to tobacco smoke by providing a framework for tobacco control measures to be implemented by the Parties at the national, regional and international levels in order to reduce continually and substantially the prevalence of tobacco use and exposure to tobacco smoke.

Measures in the FCTC for reducing the demand for tobacco:

- price and tax measures on all tobacco products;
- protection from exposure to tobacco smoke in indoor work places, public transport, indoor public places and other public places as appropriate;
- guidelines for measuring, testing and regulating the contents of tobacco products;
- regulation of manufacturers' disclosures about the contents and emissions of tobacco products both to government authorities and the public;
- banning misleading or deceptive packaging and labelling of tobacco products, including terms such as 'low tar', 'light', 'ultra-light' and 'mild'; requiring rotating health warnings placed on no less than 30% of principal display area on all packaging;
- education, communication, training and public awareness about tobacco use and its consequences;
- a comprehensive ban on all tobacco advertising, promotion and sponsorship or, in case of constitutional limitations, restrictions on such activities; and
- effective measures to promote cessation and adequate treatment for tobacco dependence.

Measures in the FCTC for reducing the supply of tobacco:

- measures to eliminate or prevent illicit trade in tobacco products;
- banning of sales to and by minors, as determined by domestic or national law; and
- promotion of economically viable alternatives for tobacco workers, growers and sellers.

1 The first forty nations to sign the FCTC were Algeria, Bangladesh, Botswana, Brazil, Burundi, Czech Republic, Democratic People's Republic of Korea, Denmark, Egypt, Finland, France, Gambia, Ghana, Greece, Hungary, Iceland, Islamic Republic of Iran, Israel, Italy, Kuwait, Luxembourg, Malta, Marshall Islands, Mauritius, Mongolia, Mozambique, Netherlands, New Zealand, Norway, Palau, Paraguay, Qatar, Senegal, South Africa, Spain, Sweden, Thailand, United Kingdom, Uruguay and Yemen. The European Community signed the FCTC as a regional economic integration organization. Norway is the first nation to have ratified the FCTC.

2 A copy of the treaty is available at http://www.who.ch.

Conclusions and recommendations

NGOs must plan their activities for optimal effect in at least some of the above areas. Concerted campaigns are needed to advocate laws and measures, to heighten public knowledge and to help people to make healthy choices. It may be useful to establish a task force to plan and coordinate activities, starting by forging links with key actors in the community.

To encourage legislation, cancer societies should use lobbying and media advocacy [45]. They should facilitate access to information drawn from research about the causes, consequences and costs to individuals and society of tobacco use by using manuals, fact sheets, workshops, internet sites and campaigns [13].

NGOs have a number of options for working towards social change as measured by established criteria, including support for clean air laws, knowledge about health consequences, support for stronger restrictions on the tobacco industry and support and encouragement not to start smoking and for stopping smoking. Again, advocacy is a major tool; it is particularly effective if it represents major sectors of society. Thus, partnerships, alliances and coalitions can increase the impact of advocacy campaigns and government lobbying [43]. NGOs can use advocacy to investigate and lobby for improved regulation of the sales of nicotine delivery devices (including nicotine replacement and all forms of tobacco), which takes into account different levels of toxicity. NGOs have an especially important role in using information from internal documents of the tobacco industry and monitoring the behaviour of the industry [45].

> **"The vector here is not a rat flea nor a mosquito but the tobacco industry, which is considerably more adaptable and much richer than are fleas or mosquitoes."**
>
> F. Bass, Globalink, 6 January 1998.

Cessation and prevention programmes and health education campaigns should be related to activities for legislation and social change. Interventions supported by social measures and available on a large scale could prevent millions of deaths globally [64]. Well-funded, coherent wide-reaching prevention programmes that combine school programmes and media strategies with intensive campaigns to reach parents and the larger community can influence the rates of smoking among children, although school-based programmes alone appear to have no more than a short-term impact [13,65]. Community campaigns do not guarantee success: they can reduce prevalence but only if they are large, well-funded and multifaceted and include advocacy, intervention, policy and countermarketing activities. [13,52,66].

NGOs should actively encourage opportunistic interventions by health professionals for all the smokers they encounter. The potential increase in cessation rates is 2–8%, depending on the intensity of the intervention and the population [59]. The role of other health professionals should also be explored, although the evidence of effectiveness is weaker. In the United Kingdom, minimal advice from general practitioners has been estimated to result in 2% cessation among 80% of the smoking population, which would save 3034 life-years per health authority region, costing £94 per life gained [14]. The total costs of effective cessation activities per life gained in the United Kingdom, giving less value to life years saved in future than those gained immediately, ranged from £212

From the Tobacco Industry

http://roswell.tobaccodocuments.org

But strong-arm tactics can also be used: Make it Hurt—the NRA (National Rifle Association) strategy. Let politicians know the down-side of anti-activity by identifying a vulnerable candidate, bringing forces to bear to cause him/her to lose the election, then discreetly let other politicians know we have done this.

Source: Trust Us. We're the Tobacco Industry. (www.pmdocs.com)

Not interested in minors smoking?

From a 1978 memo "The success of NEWPORT has been fantastic during the past few years. Our profile taken locally shows this brand being purchased by black people (all ages), young adults (usually college age), but the base of our business is the high school student."

Source: Minnesota Trial Exhibit MN10195 (www.tobaccodocuments.org)

Not addictive?

In 1963, Addison Yeaman, Vice-President and General Counsel for Brown and Williamson, a subsidiary of BAT, wrote: "…the 'tranquillizing' function of nicotine… together with nicotine's possible effect on obesity, delivers to the industry what may well be its first effective instrument of propaganda counter to that of the American Cancer Society, et al, damning cigarettes as having a causal relationship to cancer of the lung. … Moreover nicotine is addictive. We are, then, in the business of selling nicotine, an addictive drug."

Source: Supplement to "Tobacco Industry in its own Words" (www.ash.org.uk)

to £873. These are lower costs than most medical interventions. Nevertheless, only 29% of smokers in the United Kingdom reported having received advice from their general practitioners [59], and similar rates have been found elsewhere [67,68], although they may be rising. The long-term effectiveness of interventions rises as the intensity rises and the population base decreases. Fully implemented guidelines for intensive cessation programmes are effective, however, in at most 25% of cases. Furthermore, the programmes are rarely fully implemented [28]. In addition, there is wide variation in clinical practice, despite the availability of effective treatment. It might be useful to encourage national standards of practice (clinical guidelines) in relation to tobacco cessation programmes and to use a wide variety of approaches, including advocacy, to advance the use of guidelines that can cross boundaries between specialties and professional bodies [58]. There is no evidence that a programme can be improved by new information manuals or support materials; the most effective use of resources is to increase the availability of such materials, not to develop new ones [13].

NGOs should fund and run trials and/or collect research results for dissemination to the community and decision-makers. They can facilitate or seek the best approaches to helping health professionals to motivate smokers to stop and ensuring that smokers have access to the available aid. A report of a review group on progress in lung cancer of the National Cancer Institute (USA) [28] recommended that advice on smoking cessation should be a routine part of any clinical trial involving smokers. "Numerous untapped opportunities exist among ongoing intervention trials for tobacco-related research to be conducted, integrated, or supplemented. These opportunities-which could range from cessation research to collection of moderator variables to establishment of a longitudinal cohort-can be cost effective, unique, and opportunistic." The group also reported that models of the causes of initiation, maintenance and cessation of tobacco use were needed, with knowledge about the most effective delivery of treatments and interventions, early detection of trends, key moderator variables and population disparities and vulnerability to the tobacco industry.

The ultimate goal of tobacco control is consistently to reduce morbidity and mortality from diseases caused by tobacco use. A number of actions can be undertaken to influence people's use of tobacco. They can be classified globally into legislation and policy, public awareness and values, and programmes and should be envisaged as mutually reinforcing. Legislative actions provide the base upon which social change can build. Public awareness and values influence the process that transforms public health into individual health choices. Programmes are set up for individuals or groups of individuals, and their success is facilitated by the legislative base and supportive social values.

Failure to give high priority to tobacco control limits our capacity to fight cancer. Tobacco control cannot be left to a few dedicated, zealous volunteers. It demands competent, well-informed staff with time, funding and resources. In many organizations, the human and institutional capacity to carry out appropriate tobacco control programmes, research and advocacy is extremely weak. If a cancer society wants to prevent cancer in the population, it must include tobacco control among its major activities and staffing priorities.

Measures and desired outcomes in tobacco control

Measure	Desired outcome
Legislation and policy	
Regular tax increases on all tobacco products	Optimal price disincentives for experimenting with or using tobacco products
Bans on all forms of tobacco advertising, promotion and sponsorship	Less incitation to smoke, weakened brand loyalty, less initiation
Clean air laws	Protection from involuntary risk, increasing social value for not smoking
Regulations on product content and packaging	Protection from additional toxicity, increased consumer knowledge, less incitation and brand loyalty
Research support	Increase knowledge base
Institutional, staff and financial support	Adequate resources for action
Public awareness and values	
Advocacy campaigns	Support for clean air, advertising bans, tax increases and other tobacco control laws and policy
Information	Better public knowledge of the causes, consequences and costs of tobacco use
Involvement of all sectors of society	Support for not smoking and for stopping
Coalitions	More effective advocacy, greater access to the media
Surveillance of tobacco industry behaviour, past and present	Public outrage and public support for restrictions on the tobacco industry
Litigation	Holding the tobacco industry responsible for its behaviour, increasing information about internal industry practices
Programmes	
Effective cessation programmes	Increased cessation
Effective prevention programmes	Less incitation to start, spread of non-smoking values
Effective protective measures	Less exposure to others' smoking, less exposure to harmful toxins

The table above indicates these domains of action and the desired outcomes for effective tobacco control. The actions are possible only in combination with institutional support, adequate funding, research and evaluation.

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Diet

Dietary factors have been estimated to account for up to 30% of cancers in Western countries. A number of international committees have recommended that the main dietary aim for risk reduction should be a varied diet rich in plant foods, with at least five portions of fruit and vegetables daily, maintaining a body mass index of 18.5–25 kg/m2 and adopting a physically active lifestyle.

Trials of a number of interventions have shown that education alone is unlikely to bring about changes in diet, and no single intervention will affect a whole population. Comprehensive community programmes theoretically offer the best approach to dietary change in a population, combined with individual interventions that include:

- *personal contact between educators and consumers;*
- *identifying and implementing social support for change;*
- *goal-setting for dietary behaviour;*
- *personalization and feedback on action;*
- *activities involving food (e.g. tasting, cooking); and*
- *targeting taste preferences.*

Attempts to change dietary behaviour must take account of promotions by the food industry and include a wide range of legislative and multisectoral approaches.

Diet

Annie Anderson
Centre for Public
Health Nutrition
Research, University
of Dundee, Scotland

Nutrition and cancer: scientific evidence for disease etiology

Food and nutrition are considered major environmental influences on the global burden of non-communicable chronic diseases, notably cancer, cardiovascular disease and strokes [1]. Many aspects of nutrition have been considered potentially harmful to human health, including bio-technological alterations such as irradiation and genetic modification; as yet, however, there is little evidence to support these suppositions. Examples of carcinogenic substances in food are shown in the box; however, the real disease burden is not due to single carcinogens but to the Western style energy-dense diets, low in fruits and vegetables.

Examples of carcinogenic substances in food

- Polycylic aromatic hydrocarbons in smoked or burnt food
- Aflatoxins in nuts
- *N*-Nitroso compounds from nitrites in meat and vegetables
- Acetaldelyde in alcoholic drinks
- Acrylamide in fried and baked carbohydrate-rich foods

Dietary factors have been estimated to account for up to 30% of cancers in Western countries (see chapter on Europe's cancer burden). Current estimates suggest a slightly lower effect, but food and nutritional factors are still highly significant in disease aetiology, making diet second only to smoking as a preventable cause of cancer. The influence of diet varies by type and site of cancer. For example, cancers of the haematopoietic system (such as leukaemia) are probably not related to diet, while the most common cancers (e.g. of the breast, colon and rectum) are probably affected by food and nutrients [2]. In addition, different diet and lifestyle patterns indicate marked variation in the incidence of and mortality from cancer in different parts of the world, with increasing incidences in developing countries. The aetiology of cancer and the role of diet have been reviewed by the World Cancer Research Fund [2] and the Department of Health in the United Kingdom [3], and more recent evidence has been summarized by the World Health Organization/Food and Agricultural Organization of the United Nations (WHO/FAO) [1]. The type of evidence that links diet with cancer ranges from international comparisons and data on migrant populations to case–control studies, observational data and randomized controlled trials. It is recognized that the last may not be appropriate for drawing conclusions about complex factors such as diet, which includes a wide range of bioactive substances; furthermore, people may have restricted diets for long periods.

The strength of the evidence for associations between specific dietary components and cancers at specific sites varies. For example, current data suggest that breast cancer is associated with obesity and moderate alcohol intake; there is less convincing evidence for an association with high intakes of fat, meat products, dairy products, fruits and vegetables. In colo-rectal cancer, overweight and obesity and high intakes of alcohol and red meat appear to be important aetiological considerations, while high intakes of fruit and vegetables, folate and calcium may have a protective role [1]. Randomized controlled trials of dietary interventions have been undertaken mainly for colorectal cancer, but the results in relation to the outcome measured (adenoma recurrence) have been disappointing [4]. The results nevertheless raised questions about the effect of diet in different stages of disease, the specific (or general) dietary constituents that are important and the life stage at which dietary changes could have the greatest impact for prevention or delay of cancer.

There is consistent evidence that overweight and obesity (including weight gain in adult life), combined with little physical activity, play a role in the development of several cancers [5,6]. Observational data suggest that increasing energy expenditure, limiting alcohol intake and consuming adequate amounts of fruits and vegetables help to reduce the overall incidence of cancer [1–3]. The type of diet recommended for optimal health is similar to many of those found around the Mediterranean region, containing a range of protective substances, such as a high antioxidant content (from fruit, vegetables and olive oil) and foods rich in vitamins A and C [7]. The evidence for a role of other dietary patterns and behaviour (e.g. high intakes of red meat, salted food, poorly stored perishable foods, additives, pesticides and high-temperature cooking) in increasing the overall risk for cancer is less clear, although evidence for an association between low intake of dietary fibre and high risk for colo-rectal cancer is becoming stronger [8,9].

Some consumers consider that dietary supplements offer an easier route to achieving optimal nutrition than dietary change. WHO and the World Cancer Research Fund [2] agree that supplements are 'unnecessary and unhelpful for reducing cancer risk' and, in addition, are unlikely to be able to replace the large range of bioactive components still being identified in fruits and vegetables [10].

A more specific (goal-centred) approach to diet and cancer reduction that is promoted by the American Cancer Society includes:

- consuming a varied diet rich in plant foods (to include at least five portions of fruit and vegetables per day);
- maintaining a healthy weight throughout life (body mass index of 18.5–25 kg/m2); and
- adopting a physically active lifestyle (moderate activity for 30 min or more on 5 days of the week for adults and 60 min or more on 5 days of the week for children and adolescents) [11].

Population and individual factors in dietary behaviour

Many different types of intervention have been used to effect change, including national policy, community action and household or individual efforts. Action to change at any of these levels will be affected by planned programmes at other levels and also by wider social change. For example, increasing the availability of refrigeration can help to protect against stomach cancer (probably by reducing the need for salt as a preservative) [2]; however, this is not due to giving people refrigerators but to rising economic status in communities. This type of change in disease pattern reinforces the importance of the social and economic context, with respect to both developing economies and health inequalities within European countries.

Additionally, any intervention or policy should take into account the social context of food, the role it plays in reinforcing the

cultural identity of a population, the pleasures associated with food (ranging from celebration to satisfaction of appetite) and its role in shaping daily lives, rituals and routines [12]. Additionally, dietary interventions presuppose access to affordable foods in acceptable ways, in addition to raising awareness about health and disease risks.

Theoretical approaches to changing dietary behaviour concordant with current recommendations

Current dietary recommendations are targeted at whole populations and at individuals within populations, rather than at so-called 'at-risk' groups [2]. As for all behavioural modifications, no one approach will bring about change in the entire population, and a range of complementary strategies is needed to target different population groups and individuals. In the last century, promotion of dietary change tended to focus on information transfer. Theoretically, five main levels have been identified for interventions in health behaviour, namely intrapersonal (individual), interpersonal, institutional or organizational, community and public policy [13]. Thus, population interventions that take into account individual psychological determinants and environmental perspectives (e.g. life circumstances) provide an appropriate framework for action (see chapter on Theories of health behaviour and change).

In order for dietary interventions to bring about a long-term reduction in cancer risk, they must promote long-term maintenance of dietary change. Few intervention programmes, however, include a long-term maintenance component, and even fewer include measurement of the degree to which positive changes are maintained after conclusion of the intervention. In addition, dietary interventions to reduce cancer risk may lead to other health changes. The diet advocated for preventing heart disease is low in fat (notably low in saturated fat) and relatively high in complex carbohydrates, fruit and vegetables and is similar to the diet recommended for cancer prevention. Much early work on the efficacy of nutritional interventions focused on changes in cardiovascular risk factors (e.g., lower serum cholesterol after interventions to lower saturated fat intake) as markers of dietary change, and some of those studies are summarized here.

Comprehensive community approaches to dietary change

Community interventions are usually focused on a particular region, village or rural area, are implemented in settings such as schools, work places, local retail outlets or markets and churches, and involve collaboration and partnership between the private, public and voluntary sectors. Such programmes tend to incorporate local innovations, styles and activities and may or may not be led by health professionals.

A comprehensive community programme should incorporate all the elements of community interventions but additionally have backing and support from wider or national interventions, such as retail pricing policy (at national level), food advertising laws and national policies in catering establishments. These national initiatives facilitate individual access to healthy, acceptable food at affordable prices.

Both approaches include an element of 'education' about appropriate food choices, but there is no evidence that this awareness-raising approach, by itself, brings about changes in dietary behaviour.

Evidence for effective dietary change from comprehensive, community-based studies has been sparse, and a number of community-based programmes (e.g. in Minnesota and Pawtucket, USA) have failed to demonstrate significant changes in food and nutrient intake [14]. The North Karelia Project in Finland [15] is an interesting example of the success of a community intervention on a range of behaviour, including diet. These changes in behaviour were in turn associated with reductions in mortality from cardiovascular disease and cancer [16]. Nevertheless, it is difficult to conclude that the changes in behaviour and health outcomes were due solely to the effect of an intervention programme. Similar changes were also reported in the 'control' area, presumably due to 'contamination' or spread of the activities through unplanned dissemination, e.g., through national organizations operating in different parts of the country. Additionally, secular trends (e.g., economic and social changes) may have been taking place which would have facilitated the impact of the intervention, and these cannot be replicated elsewhere. Thus, while North Karelia is an important model for change, caution must be exercised in interpreting the results and transferring them to other regions.

The North Karelia project focussed heavily on community organizations (e.g. NGOs, schools, the health service) for influencing social policy. Puska [17] also highlighted wider aspects of public policy in the successful implementation of the programme, including intersectoral collaboration (e.g., agriculture and health policy), a single agency co-ordinating the efforts, industry involvement and a range of food polices, including food labelling and pricing policies.

Communication strategies involving innovation–diffusion theory (promotion of knowledge, persuasion, decision and confirmation) were also considered an important part of effecting behavioural change. Other community-based programmes have not been successful in changing dietary behaviour, and further work is needed in the design and evaluation of community projects [18,19].

Individual approaches to dietary change

Numerous interventions have had individual dietary behaviour as their primary outcome. Most have had a modest effect on life style. Interventions are generally more successful at changing dietary behaviour in populations at risk of or with disease than in healthy populations [20].

Results of effective interventions

Most intervention studies have short-term results, which indicate that effective change is possible, but the effects on long-term behaviour are not always or not yet clear.

Avoiding obesity

The group of individuals at highest risk for becoming obese are people who are already overweight. The National Institutes of Health (USA) [21] reviewed 86 randomized controlled trials on diet and weight loss and concluded that there was strong and consistent evidence that an average weight loss of 8% of initial body weight can be obtained within 3–12 months on a low-calorie diet, and that the weight loss effects a decrease in abdominal fat.

In terms of community approaches, considerable effort has been made to make the public aware of the health issues associated with obesity and the causes and management of the disease. Nevertheless, despite wide media coverage, obesity rates are continuing to rise throughout Europe, and there is little evidence for the success of obesity prevention programmes.

It is widely recognized that schools are an appropriate setting for interventions, but there is little evidence for the efficacy of school approaches. A report from Singapore [22] showed a decline in the prevalence of obesity, from 16.6% to 14.6%, between 1992 and 2000 among pupils aged 11–12 years and a similar decline, from 15.5% to 13.1%, among 15–16-year-old students over an 8-year period. A review [23] on interventions for preventing obesity in children reported only one study (Planet Health) that produced a greater reduction in the intervention group (and only in girls) versus control, and the intervention focussed on increased physical activity and dietary education [24]. A more recent school based study from Sallis et al [25] suggested favourable effects from intervention on BMI of boys but not girls. The reviewers conclude that there is a limited quality of data on effectiveness and that there is a need for well-designed studies that examine a range of interventions [23].

Increasing fruit and vegetable intake

Two reviews of interventions aimed at increasing intake of fruit and vegetables [20,26] had similar findings. The Agency for Healthcare Research and Quality (USA) reviewed 104 articles (representing 92 independent studies) and concluded that dietary interventions were consistently associated with increased fruit and vegetable consumption, with greater increases for fruit [20]. In comparison with control groups, the average increase in fruit and vegetable intake reported was 0.6 servings per day, and consistent decreases were found in the intake of total and saturated fat.

The National Institutes of Health and the National Cancer Institute (USA) reported that behavioural and food service interventions in elementary schools had a positive effect on the pupils' vegetable and fruit consumption [26]. The studies showed that it is possible to change the elementary school environment and to reinforce the healthy dietary practices taught in the classroom. The average increase was 0.62 servings per day, and the largest was 1.68 servings per day. Interventions for adults at the work site, church, family or social environment were found to be feasible and were associated with changes in the availability and consumption of vegetables and fruit. The average increase was 0.48 servings per day, and the largest was 0.85 servings per day. In both the school-based and the adult interventions, greater effects were seen in fruit consumption than in vegetable consumption.

The analyses by the Agency for Healthcare Research and Quality [20] suggested that the interventions were more successful in increasing fruit intake among children and increasing vegetable intake among adults. In addition, interventions in populations at higher risk for disease were consistently more likely to show statistically significant increases in fruit and vegetable intake than were studies in the general population. For example, all six studies conducted in high-risk populations and only eight of 14 studies in the general population showed significant effects on fruit intake. A slightly smaller difference (in five of seven studies of high-risk populations and in five of 14 studies of the general population) was observed for vegetable intake.

A healthy, varied diet

Reviews undertaken by Roe et al. [27] on healthy eating showed that studies of good quality which included some dietary outcome measure reported a beneficial effect. The most frequently measured outcome was dietary fat, and the review found that this was reduced by 1–4% of energy intake in long-term interventions in the general population. Good studies carried out in schools, work places and primary care settings showed a reduction in blood cholesterol of 2–10%. Most of the good-quality studies of community-based interventions showed no effect on blood cholesterol. The greatest reductions in fat intake (10–16% of energy intake) and blood cholesterol (7–10%) were by highly motivated individuals taking part in intensive programmes.

The North Karelia programme in Finland [15] achieved significant changes in diet associated with reductions in coronary disease, including increased consumption of skimmed milk and vegetable oil and decreased consumption of butter. In addition, vegetable consumption increased from 20 kg per person per year in 1970 to 66 kg in 1994, with similar increases in fruit consumption.

Methods and characteristics of effective interventions

No known single intervention (whether at the community or the individual level) can change dietary behaviour. Health education is deemed to be crucial but is unlikely to be successful in isolation. The methods and characteristics of effective interventions are outlined below.

Avoiding obesity

The National Institutes of Health (USA) [21] recommended lower fat intake, with a targeted reduction in calories, to promote weight loss. They also recommended that an individually planned diet with an energy deficit of 500–1000 kcal per day should be an integral part of a weight-loss programme. They reported that a combination of reduced calories and increased physical activity resulted in greater weight loss [5]. They recommended that the combination should be accompanied by behaviour therapy, which takes into account readiness to implement the plan with motivational approaches to promote compliance.

Dietary elements to be considered for weight loss

- Total energy intake
- Nutrient density
- Macronutrient composition
- Food palatability
- Meal patterns

Current evidence [28,29] on the efficacy of programmes for weight management (prevention of weight gain or promotion of weight loss) in preventing obesity highlight dietary change involving the patient's household, with support from trained personnel in a group setting, behavioural modification techniques and exercise management. For weight maintenance, the literature suggests that management approaches that provide for a greater frequency of contact between the patient and practitioner and that are long term, should be used when possible [29].

The obesity prevention programme for children in Singapore [22] was based on a 'trim and fit'

programme aimed at improving diet and physical fitness by a multidisciplinary approach including overweight students, parents, teachers and the school environment. Nutrition education was integrated into the formal school curriculum, and food and drinks sold in schools were subject to control measures.

In a review of interventions [30] to prevent weight gain in people of all ages and weights, only one study, a randomized controlled trial, showed a significant effect on weight. This intervention [31] involved a correspondence programme and a mix of behavioural change methods, including goal setting, self-monitoring and contingencies.

While a variety of interventions for prevention of obesity have been suggested, the evidence for the efficacy of community interventions is weak, either because they have been shown to have little effect or they have not been evaluated. Such gaps in evidence point to the need to continue to design and evaluate population-based interventions, especially those that address the 'obesogenic' environment. The ANGELO model for understanding the obesogenic environments as described by Swinburn et al. [32] highlights the importance of the physical (what is available), economic (the costs), political (the 'rules') and sociocultural (attitudes and beliefs) environment in setting priorities in research and interventions.

Increasing fruit and vegetable intake

Many local, community and large-scale initiatives have been launched to increase fruit and vegetable consumption to 'five a day'. These include a large-scale public–private partnership between the Produce for Better Health Foundation and the National Cancer Institute (USA) [26]. Major aspects of the programme were to disseminate the five-a-day message by innovative promotion and media campaigns (including advertising by the industry and forming relationships with media outlets to generate news stories related to the programme) and to implement the programme in a wide variety of work places, schools and communities. Examples are shown below.

Researchers at the National Cancer Institute (USA) [26] found that the strongest predictors of dietary change were awareness of the recommendation to eat five or more servings of vegetables per day, taste preferences and self-efficacy (in this context, confidence in one's ability to eat vegetables and fruit in a variety of situations). The Agency for Healthcare Research and Quality [20] also reported that use of social support components (e.g. family and peer involvement) was associated with greater increases in fruit and vegetable intake. For example, all five studies that included a social support component and only nine of 17 studies not using social support showed a statistically significant increase in fruit intake (see box below).

Studies that involved goal-setting and interactive activities with food (e.g., food preparation, tasting, eating) were more likely to result in statistically significant increases in fruit and vegetable intake, although the magnitude of the increases was not notably higher than in studies in which such techniques were not used.

A healthy, varied diet

Although dietary interventions differ by setting (schools, universities, work places, primary health care centres, communities, cafeterias and supermarkets), all have some educational aspect, to raise awareness about appropriate food choices. They may also include elements to increase access to and the availability of a varied diet, addressing affordability and acceptability of dietary change. Current approaches generally take account of educational, motivational and behavioural theory. The North Karelia community intervention in Finland [15] included social marketing and innovation–diffusion theories to design a community-wide programme of behavioural change, including mass catering interventions and nutrition education with a focus on maternal and child health services. Roe et al. [27] suggested that the most effective interventions to promote healthy eating in schools, work places, primary care centres and the community tended to focus on diet only or on diet and exercise. The best interventions in these settings were based on theories of behavioural change, which may, for example, encourage clear goal-setting. Other characteristics associated with effectiveness included some personal contact with individuals or small groups, some family involvement and scope for personalization. Changes in behaviour and in risk factors were also more successful in these settings. Other characteristics of effective interventions were the promotion of changes in the local environment (e.g. the catering sector) and multiple contacts over substantial periods of time.

Missing information and research topics

This review has focused on changing dietary behaviour. Information about the impact of such changes on overall health and disease profile is needed, but such data may take decades to collect, and randomized controlled trials cannot be undertaken, as they can for treatment interventions. While considerable work has been undertaken on the design and evaluation of complex interventions, one of the major challenges is to design, identify, document

Examples of programme work in 'five-a-day' interventions in the USA [26]

Activity	Schools	Work sites	Community (WIC and churches)
In setting	Classroom activities	Launching event	Pastor and church support
Wider involvement	Parent involvement	Family-focussed materials and activities	Lay health advisers, peer educators
Action in environment	School food service	Changes in food environment	Educational sessions
Partnerships	Industry involvement	Employee advisory boards	Community coalitions
Communications	Point-of-purchase education	Newsletters	Point-of-purchase promotions
Media	School media marketing campaign	Media, self-help manual, resource guide	Printed material and visual reminders
Community collaborators	Archdiocese, commodity groups, boards of education	Health centres, small businesses, public employers	WIC sites, local health departments, co-operative extension service
Miscellaneous	Social marketing approach with e.g., schools, supermarkets	Gifts	Tailored mail

WIC, Special Supplemental Nutrition Programme for Women, Infants and Children

Strategies for social support in dietary change programmes [33]

Support	Examples
Couples	Identify personal actions of partner Contract to agree to provide practical support.
Family	Group activities Family interactions that influence food consumption
Friends	Daily telephone contact Discourage unacceptable behaviour
Support group	Monitor each other's weight Use group problem-solving

and reproduce intervention programmes [34]. Measuring the impact of community-based interventions is challenging, it is difficult to identify specific effective elements, and it may take years to show an effect in a population group.

Avoiding obesity

In order to judge any preventive effect, long-term evaluations are needed of programmes that include the following approaches [1]:

- Maintain regular physical activity throughout life.
- Minimize the intake of high-fat and high-sugar foods.
- Maintain a diet high in vegetables, legumes, fruit and wholegrain cereals.
- Minimize the intake of high-fat and high-sugar drinks.
- Avoid large portion sizes and energy-dense foods.
- Promote breastfeeding.
- Promote maternal and child nutrition to prevent stunting.

The ways in which these messages might be delivered should ideally involve a comprehensive, community approach (which also allows assessment of individual approaches) and indicators at the community level, although the cost-effectiveness of any approach must be fully evaluated.

The prevention of weight gain in adult life, avoiding overweight, avoiding obesity, maintaining current weight (e.g. avoiding weight gain if the weight range is 18.5–25 kg/m2) must be considered, together with treatment of overweight and obesity. Comprehensive approaches to address these issues throughout life (school environment, antenatal care, work site, retirement activities) need to be assessed.

Increasing fruit and vegetable intake

The follow-up of intervention programmes has generally been too short to determine whether favourable dietary changes are sustained. There appears to be a particular need to identify effective interventions to increase vegetable intake. As with all dietary interventions, care should be taken to identify any other aspect of the diet that changes, so that the total energy intake does not increase if 'five a day' are added to the diet rather than provided as a substitute for other dietary components.

A healthy, varied diet

The best examples of overall dietary change come from the Nordic countries [35]. These serve to remind us that promoting dietary change is not just due to effective health education programmes and individual action but also community participation, industry involvement and national policy frameworks with implementation and monitoring strategies. The transferability of strategies used in one country to another country remains unclear.

Puska [16] also reminds us that the food industry plays an important role in influencing healthy food choices, and that life styles and commercial products cross borders. The industry can work in both directions, for example in a positive way by formulating products with a low fat content or producing prepared meals with a high fruit and vegetable content, or in negative ways by effective promotion of excess consumption of energy-dense foods and sweetened drinks [36].

Appropriate health claims, nutrition labelling and nutrition 'signposting' [37] can also be a useful form of collaboration between industry and other sectors. Modulating the impact of the food industry on eating habits may require fiscal measures such as taxation of foods high in sugar [38] or fat or advertising restrictions. All these approaches remain to be assessed in terms of effectiveness for helping consumers to select a healthy balanced diet.

Evaluations are needed of the processes that can successfully be used in interventions, the effects of interventions on food choices, nutrient intake and longer-term health outcomes and the cost-effectiveness of intervention approaches. Many interventions are multi-faceted, and it is challenging to untangle the effects of individual parts and the effectiveness of the sum of all actions and of the individual strands.

The health effects of consuming genetically modified food crops (and other new techniques) remain an important research area for the next few decades.

Promotion by the food industry of energy-dense foods and sweetened drinks

Use of 'value for money' concepts

- large portions
- 'free' purchase offers ('buy one, get one free')
- loyalty cards and schemes

Promotions

- sponsorship of sports, scout or guide events
- exchanging food company vouchers for musical instruments, sports equipment, computers
- use of character licensing for advertising e.g. Disney figures
- free gifts in breakfast cereals
- television advertising during children's television hours

Provision of food and refrigeration equipment and vending machines for schools

Conclusions and recommendations

The interventions described above are relevant in the context of cancer prevention and also for a range of other chronic diseases, such as coronary heart disease and stroke. In planning the activities and assessing the outcomes of dietary interventions, it is important to keep overall health and deaths from all causes as part of the outcome.

If the North Karelia model is considered a basis for behavioural change, it is clear that action is needed at three levels. The first is national policy and legislation:

Nutrition signposting: Example of 'pick the tick' for sodium (National Heart Foundation of New Zealand) http://www.heartfoundation.org.nz pick the tick

- Food manufacturers whose products meet defined nutritional criteria are allowed to display the 'Pick the Tick' logo on labels.
- The tick is used by 59% of shoppers in making healthy food choices.
- Food companies are encouraged to reformulate products if they fail to meet the criteria and to develop new products specifically to meet the 'Pick the Tick' criteria.
- Between July 1998 and June 1999, 'Pick the Tick' influenced food companies to exclude approximately 33 tonnes of salt by reformulation and formulation of 23 breads, breakfast cereals and margarine [34].
- Breakfast cereals showed the largest reduction in sodium content, by an average of 378 mg per 100 g of product (61%). The content in bread was reduced by an average of 123 mg per 100 g (26%) and that in margarine by 53 mg per 100 g (11%).
- 'Pick the Tick' appeals to the food industry as a tool for marketing food products and has provided an incentive to improve the nutritional value of foods.
- The tick on approved products not only acts as a 'nutrition signpost' for consumers but can also significantly influence the formulation of products without sacrificing taste or quality.
- Individual foods that are promoted must fit into the framework of a healthy balanced diet and do not by themselves provide all the nutritional properties required!

The second level is community programmes involving private, public and voluntary bodies, addressing issues as wide-ranging as health promotion and local pricing policies. The programmes can be implemented in a wide range of settings, including schools, health services and local authorities.

At the third level are interventions aimed at changing individual behaviour, where the following recommendations should be considered:

- identification and targeting of high-risk groups (or whole population);
- personal contact between educator and consumers;
- identifying and implementing social support for change;
- goal-setting for dietary behaviour;
- personalization and feedback on action;
- activities involving food (e.g. tasting, cooking); and
- targeting taste preferences (e.g helping children to develop a liking for vegetables).

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Policy and legislation to encourage healthier eating

Measure	Desired outcome
Legislation	
Tax on foods with a low content of a range of nutrients, e.g. soft drinks	Optimal price disincentives for regular soft drinks consumption by all population groups
Restriction on advertising, promotion and sponsorship (especially that directed at young people)	Less familiarity, change of focus from the image to the food content
Nutrition labelling	Standard format for ingredients and quantities per recognized unit weight
Nutrition signposting	Agreed standard for fat, fibre, fruit and vegetable content which the consumer can recognize as appropriate in a healthy diet, e.g health symbol
Nutrition claims	Greater understanding of the relationship between food and health
Nutrient standards for school meals	Guaranteed provision of basic nutrient requirements for children
Changing public values	
Advocacy campaigns	Consistent dietary message promoted by respected social figures and organizations
Information campaigns	Better public knowledge of the ways of achieving appropriate nutrient intake
Support from public and private catering	Agreed minimum standards for key nutrients in menu choices
Coalitions	More effective advocacy, greater access to the media

Programmes to promote dietary change and energy balance

Measure and examples	Examples of desired outcomes
'Five-a-day' programmes	Private, public and voluntary support to make fruit and vegetables culturally acceptable and available at affordable prices
Obesity prevention	Community efforts to promote safe environments and motivate increased physical activity
Healthy balanced diet	Recognition and community support for choosing a healthy balanced diet throughout life

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The evidence for a preventive effect of physical activity against colon cancer is strong, while that for an effect against breast cancer is somewhat weaker. The mechanism appears to be partly related to weight control, but high physical activity also has independent effects on cancer risk.

It is recommended that people should engage in at least 30 minutes, but preferably 60 minutes, of physical activity of moderate intensity (such as brisk walking) daily. The daily activity dose can be divided into shorter parts, such as four times 15 minutes.

Increasing physical activity requires a combination of strategies at the level of the population and high-risk individuals.

In populations and communities, it is important to improve factors that make physical activity more accessible to individuals. Environmental reorganization to increase safety and access to a greater number of varied facilities for all segments of the community is an important consideration in planning for health and will involve NGOs working in partnership with several municipal sectors (e.g. health, urban planning, transport, education, sports).

At the individual level, appropriate behaviour modification techniques should be incorporated into intervention strategies to increase efficacy.

Physical activity

Physical activity

Mikael Fogelholm
The UKK Institute for Health Promotion Research, Tampere, Finland

Physical activity and cancer: scientific evidence for disease etiology

A considerable number of cohort and case–control studies have evaluated the relationships between physical activity and risks for developing various forms of cancer [1]. There is sufficient evidence to conclude that a high level of physical activity, when compared with low activity, reduces the probability of getting colon and breast cancer by about 20%. The evidence is stronger for colon than for breast cancer. There is also some evidence that physical activity protects against endometrial cancer, but the evidence is weaker than that for colon and breast cancer. Studies on physical activity and rectal, ovarian, prostate, lung and testicular cancer do not clearly show any associations. In the above studies, high physical activity was defined as that of individuals in the highest category (tertile, quartile or quintile). Because there are various ways of assessing physical activity and various categories are used, it has been difficult to conclude whether a 'minimal effective dose' exists. In their review, Thune and Furberg [2] suggested that 20–25 'metabolic equivalent hours' of activity are needed to bring about a preventive effect on cancer. This dose of physical activity is equivalent to approximately 2.5 hours of vigorous exercise (producing marked breathlessness and sweating, as during running or aerobics) or 4–6 hours of moderate physical activity (producing little or insignificant increase in breathing frequency and sweating, as during brisk walking) per week.

One potential cancer-preventing effect of physical activity is body weight control. Several cross-sectional studies have shown that physically active individuals have a lower body mass index, relative fat content, waist circumference, waist:hip ratio and visceral fat mass than sedentary individuals [3]. Observational studies also show that high or increased physical activity is linked to better weight control both before (as a primary prevention strategy) and after weight reduction [4]. Nevertheless, some effects of physical activity seem to be independent of obesity. A strong putative mechanism is alteration of the hormonal milieu [4]. Many studies have shown that strenuous physical activity acutely (for 0–2 hours) decreases plasma insulin and increases the serum concentration of sex hormone-binding globulin and total and free testosterone. In the longer term, an increase in physical activity lowers the fasting plasma insulin concentration, but the effects on sex hormone-binding globulin and androgens or oestrogens are less clear. Exercise also acutely increases the absolute concentrations of insulin growth factor-1 and binding proteins, but again the long-term effects of regular exercise are less clear. Moderate physical activity has also been shown to improve immune function [5], and this could be another mechanism by which physical activity prevents some forms of cancer.

Although physical activity may have independent effects on cancer risk, part of the protective effect seems to be mediated through improved weight control. Therefore, if physical activity is used effectively as a preventive strategy against cancer, it should at the same time be used as a preventive measure against obesity. Because the scope of the present review is prevention of cancer, the focus is on large-scale studies of increasing physical activity at the community level and – at the same time – preventing weight gain. Only five interventions, most reported in multiple publications, can be included [6–15].

Results of interventions

Of the four projects in which physical activity was assessed, two [12,15] found no significant effects of the intervention, although there was a tendency for increased physical activity in the intervention areas in one [12]. The residents of the intervention communities included in the Minnesota Heart Health Study were somewhat more physically active (self-reported) by the end of follow-up [9]. In the Stanford Five-city Project, the intervention had a positive effect on physical activity in independent, cross-sectional samples but not in the cohort survey [6,13].

Although the results for physical activity were positive in most projects, the effects of the intervention on body weight change were disappointing. Three projects found no effect on body mass index [10,12,15]. Moreover, no change in the prevalence of overweight (body mass index > 25 kg/m2) was seen in one project [14]. In the Stanford Five-city project, body mass index increased less in the intervention than in the control communities, but this effect was observed only in the independent, cross-sectional surveys [8].

Methods and characteristics of interventions

Health education was the main component of the community interventions. The premise was therefore that improved knowledge, skills and positive attitudes lead to changes in behaviour and, further, to changes in disease variables. Health education was carried out through the mass media (e.g., local television and radio channels, newspapers, print materials), by peer groups and by health professionals. In only one project were there deliberate efforts to change the physical environment by construction of walking and fitness paths [15]. All interventions had elements that were distributed unselected to a wide audience, although targeted interventions were also used.

Missing information and research topics

The studies cited in this brief review show that positive effects of physical activity in preventing weight gain are not easily demonstrated in (controlled) interventions. There are several potential explanations for the problems encountered in increasing physical activity in communities:

- The focus has been on traditional physical activity, rather than usual daily activity.
- Too little priority was given to physical activity in the interventions, because the primary objective of all of them was to decrease deaths and morbidity from cardiovascular disease.
- The interventions were too general, and hence important subgroups may have been lost. Interventions directed towards high-risk individuals (e.g., overweight individuals or children of obese parents) are therefore needed.
- All the interventions had a strong emphasis on education. There are clearly several unused possibilities for modifying environments to facilitate or promote physical activity [16]. These include increasing the safety and convenience of exercise facilities for all community residents and improving the safety and availability of biking and walking paths, as well as building stairways in public buildings and on work sites. New interventions should identify and modify settings used daily by a significant proportion of the community. Moreover, behaviour modification approaches might improve the efficacy of physical activity interventions and encourage long-term adherence to increased individual or group activity [17].

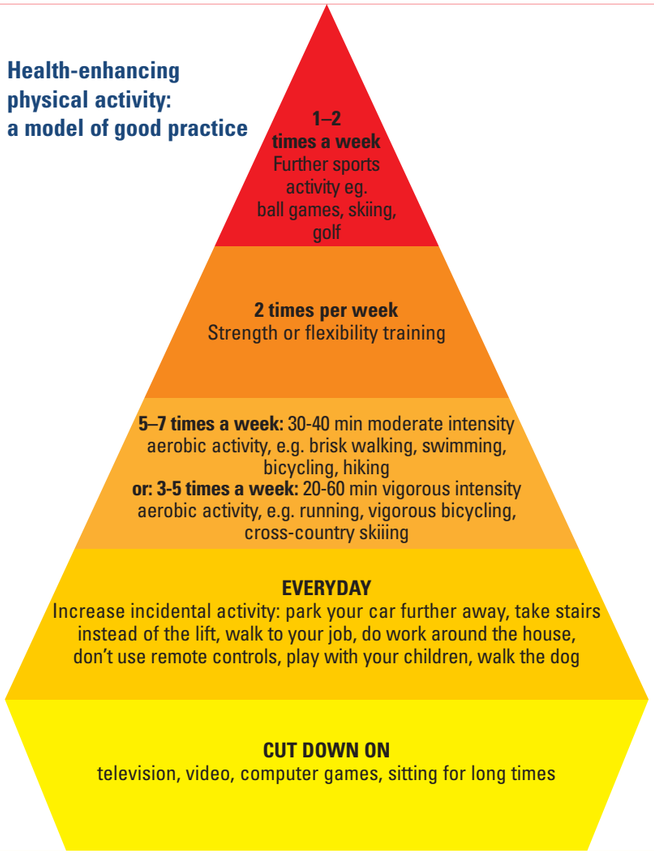
Conclusions and recommendations

Evidence for the importance of physical activity in cancer aetiology is becoming stronger, suggesting that increasing everyday activity and exercise can reduce cancer risk. The increasing prevalence of obesity (and its role in cancer development) highlights the need for strategies and actions to encourage increased physical activity in the population.

It is recommended that individuals should engage in at least 30 minutes, but preferable 60 minutes, of physical activity of moderate intensity (such as brisk walking) on a daily basis. The daily activity dose can be divided into shorter periods (e.g. four times 15 minutes). More detailed recommendations can be shown, for example, as a 'physical activity pyramid'.

The evidence from intervention studies aimed at changing physical activity levels suggests that increases in all types of activity (from stair climbing to sports) should be addressed, and more studies should be devoted to high-risk groups, such as children of obese parents. Educational approaches in themselves are unlikely to be effective in changing behaviour, and further work is needed to identify environmental facilities that will encourage increased activity. Effective behavioural programmes should be developed on the basis of theoretical models from social psychology. Community interventions designed to increase physical activity should therefore use possibilities for modifying environments to promote physical activity. The actors in interventions (e.g., NGOs) must therefore work with several municipal sectors (e.g. health, urban planning, transport, education, sports). Moreover, a combination of strategies for the general population and high-risk individuals should be used.

Health-enhancing physical activity: a model of good practice



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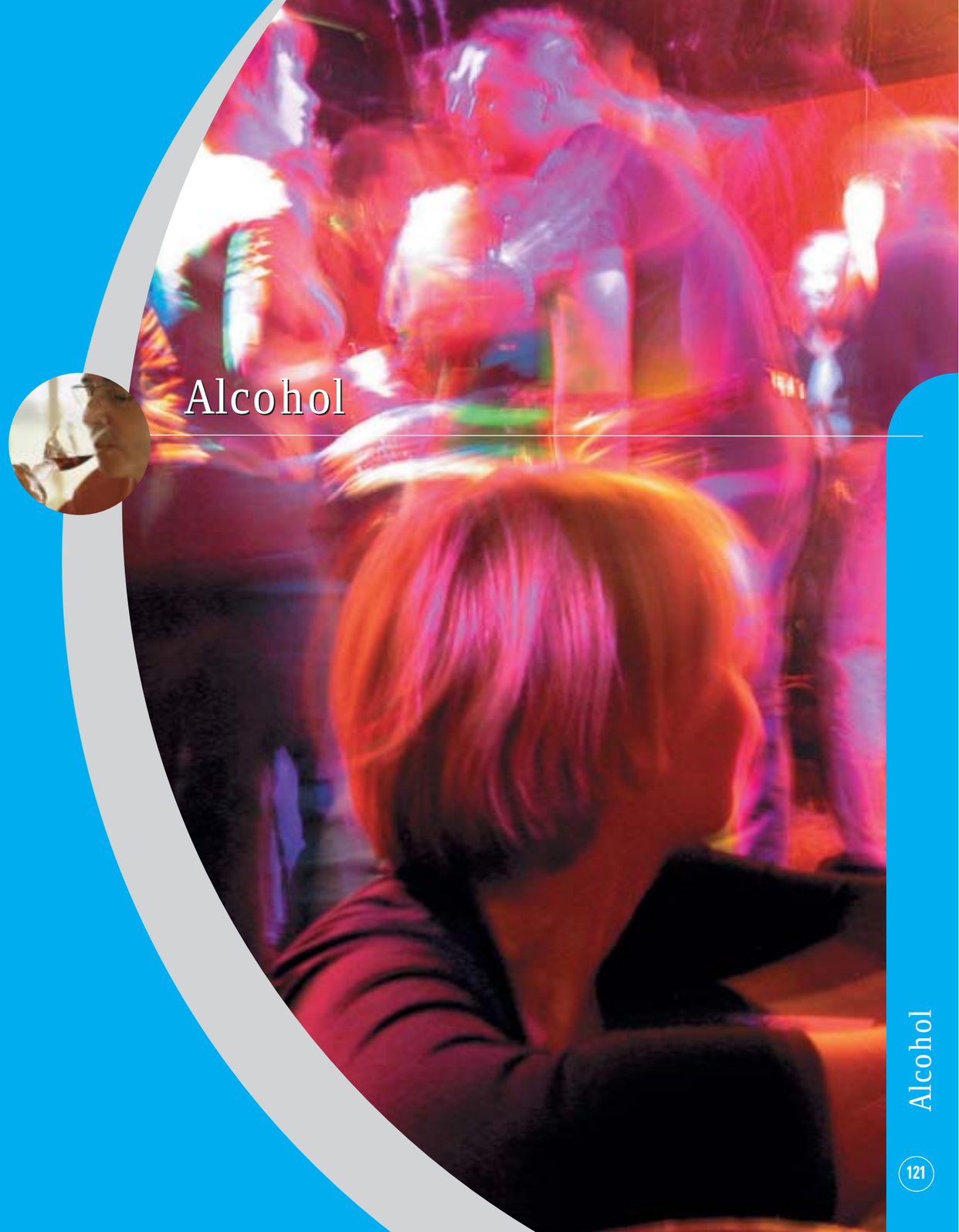
The relationship between alcohol consumption and certain types of cancers is well established. In general, two approaches to reducing alcohol consumption can be distinguished: supply reduction and demand reduction. A rich body of literature is available on supply reduction, including pricing policies, age restrictions, outlet density and hours of sale, which show evidence of effectiveness. The evidence for the effectiveness of demand reduction is less convincing. There is little evidence for a substantial, lasting effect of education about alcohol at school. Mass-media campaigns are generally insufficient to change behaviour. Community interventions, however, are a promising approach. There is also sufficient evidence for the effectiveness of brief interventions in general practice.

The role of independent NGOs in prevention is crucial: they not only act as pressure groups but also have a norm-setting role for the wider public.



Alcohol

Alcohol

Richard Müller
Swiss Institute for
the Prevention
of Alcohol and
Drug Problems,
Lausanne,
Switzerland

Alcohol and cancer: scientific evidence for disease etiology

The relationship between alcohol consumption and cancer has long been established in the scientific literature. The link between alcohol use and cancers of the upper digestive tract (oral cavity, pharynx, larynx, oesophagus) is well demonstrated and beyond doubt. There is also evidence of a relationship between alcohol use and liver cancer, and links between alcohol ingestion and both breast and rectal cancer seem probable. There is no convincing evidence for a relationship between alcohol drinking and cancer of the urinary bladder, and no links have been shown with cancers of the stomach, pancreas, prostate or kidney [1,2].

Upper digestive tract

Cohort studies show a relative risk for cancers of the oral cavity and pharynx that is two to five times higher for heavy alcohol drinkers than for moderate drinkers. For cancer of the oesophagus, the relative risk varies between 2 and 5 according to the study, and that for cancer of the larynx is between 1.4 and 5.4 [3]. It is generally agreed that heavy drinking combined with smoking increases the risks for these types of cancer in an additive or multiplicative way [4].

Liver

The relative risks attributed to alcohol consumption for liver cancers vary between 1.0 and 35, according to various studies [1]. It is well established that heavy drinkers have a greater risk of developing cirrhosis of the liver, which itself is a risk factor for liver cancer.

Breast

In numerous studies, long-term alcohol consumption has been associated with a small increase in a woman's risk for breast cancer [5], although controversy remained about the interpretation of these studies. Substantial new evidence from a re-analysis of the individual data from 53 epidemiological studies in several countries suggests that the risk for breast cancer is elevated for women who drink more than 10 g of alcohol (one 'standard' drink of wine, beer or spirits) per day, when compared with abstainers [6]. Since breast cancer is a frequent cause of death among women, even this small risk is important for public health.

Colon and rectum

The scientific literature reveals a weak positive association between alcohol drinking (particularly beer) and colo-rectal cancers [7]. The results of the available studies are not, however, homogeneous.

Population and individual factors in alcohol-related behaviour

Social norms and alcohol consumption in western societies

Alcohol use is deeply rooted in most Western cultures. Cultural and social norms shape the drinking patterns of a society, defining for whom, the amount and the situations in which drinking is a socially meaningful act. Norms determine how drinking is integrated into daily life. It is commonly known, for instance, that alcohol consumption is more prevalent among men than among women and that excessive drinking by women is more negatively sanctioned than that by men. Most young people in many countries have their first encounter with alcohol quite early in their lives, usually at a celebration in the family circle. Hence, in most Western societies, learning to drink is an ordinary developmental task for young people. According to its social and cultural norms with regard to alcohol, each society can be assigned a risk potential for the emergence of alcohol-related damage. The problems associated with alcohol drinking vary not only with per-capita consumption of alcohol but also with the drinking pattern, such as 'binge drinking' [8].

In some Western countries, like France and Italy, alcohol consumption has been levelling off or declining in recent years. In other European countries, like Estonia, Finland, Ireland, Poland and Spain, consumption is increasing [9]. The main trends in the drinking patterns of young people are greater experimentation with alcohol among children and an increase in high-risk activities such as 'binge drinking'. Among adolescents, there are clear links between the use of alcohol, tobacco and illegal drugs.

A number of concerns have been raised about the marketing of alcohol to young people. Jackson et al. [10] reported that "recent years have seen a growth in the value that youth culture attaches to brand labels and symbols and a move away from the healthy-living ethos. The alcohol industry's response to these trends has been to design alcoholic beverages that appeal to young people, using well-informed and precisely targeted marketing strategies." (see picture).

The controversy about the risks and benefits of alcohol consumption

While there is evidence that alcohol consumption can confer health and social benefits, these are outweighed by the negative effects of alcohol on physical and mental health [5,11]. Alcohol caused 4% of the global burden of disease, measured as disability-adjusted life years, and 3.2 % of deaths in 2000 [12]. The physiological and psychological effects of alcohol consumption have been well described in the context of other diseases, including those of the liver, digestive tract, central nervous system and cardiovascular system. Alcohol intake contributes to increased risks for hypertension and obesity [13]. It should be recognized that there is no physiological requirement for alcohol, and it is addictive. Alcohol intake affects the intake of other nutrients and has a caloric value of 7 kcal/g, plus calories derived from the sugars present in the beverage (derived naturally or from sweetened additions).

Although cancer risk is increased by a daily alcohol intake of more than 10g (one standard glass), this level of intake may have a cardio-protective effect. Nevertheless, there is no evidence to suggest that the potential benefit is enough to promote alcohol intake by current abstainers, and it is recognized that "An increased intake is not recommended as a community measure for CVD [cardiovascular disease] prevention." [13].

A review by Wollin and Jones [15] showed that some of the protective effects of alcoholic drinks can be attributed to the alcohol content and others to bioactive (mostly phenolic) components found in wine (or simply grape juice). The authors also make the point that "consumption of red wine alone will not inhibit the development of CVD [cardiovascular disease]."

Methods and characteristics of effective alcohol control

Generally speaking, there are two main strategies for prevention of alcohol consumption: demand-oriented and supply-oriented measures. Obviously, these measures can aim at reducing both long-term and acute risks associated with drinking, such as accidents and violence. As acute risks are not of concern for cancer prevention, they are not discussed here.

Supply-oriented measures

The norms and values of everyday behaviour are fairly resistant to attempts to change by education or information. This might be particularly true for drinking patterns. Supply-oriented alcohol policies are therefore of particular importance.

Price policy: Changing the price of alcoholic beverages is widely regarded as an important component of a policy to reduce consumption. Its relative effectiveness is expressed in the price and income elasticity of the demand for beverages and depends on possible substitution effects. Almost all price elasticity values are greater than zero and negative, indicating that changes in price affect consumption in a direction consistent with economic theories [16]. Elasticity values vary according to beverage type and how these beverages are rooted in drinking cultures. In English-speaking countries, for instance, it has been a common finding that the demand for beer has been less price elastic than the demand for wines and spirits [16]. The empirical evidence suggests that taxation of alcoholic drinks is a potentially useful lever for public health [9], since both heavier and lighter drinkers were influenced by changing prices of alcoholic beverages.

Outlet density: Regions with a greater outlet density and higher ratios of outlets per person tended to have higher alcohol sales and probably also higher consumption [17].

Hours of sales: Studies of changes in hours of sale or opening days for shops selling alcohol have demonstrated that increased drinking is associated with increased number of hours, and decreased drinking with the elimination of some days of sale [16].

Age restrictions: Most countries have some regulations on the minimum age for purchase. Often, however, these regulations are not severely enforced. Research on the effects of increasing and decreasing the minimum drinking age in the USA clearly showed an effect on the number of alcohol-related traffic crashes for the age group affected. A few studies found in addition that a higher minimum age resulted in a decrease in general alcohol consumption among the age groups affected by the law. The long-term impact of such measures is unclear. O'Malley and Wagenaar [18] reported lower long-term alcohol consumption in parts of North America where the legal age had been raised by at least 1 year.

Demand-oriented measures

School-based education: Education programmes on alcohol at school are the most popular approach to prevention. Three phases can be distinguished in the evolution of such programmes over the past 30 years. In the first phase, the early 1960s to early 1970s, the programmes focused mainly on providing information about alcohol. During the second phase, the early 1970s to early 1980s, so-called 'affective' programmes predominated, which focused on personal development, including decision-making and clarification of values. In the third phase, the mid-1980s to the present, the social influence model has predominated, in which social and resistance skills are developed. Overall, education about alcohol that aims at influencing drinking behaviour has methodological limitations and might have little effect [19,20].

Family-based interventions: There is no doubt that parents have much influence on the use of substances by their children, through both genetic and social factors, such as parental drinking and educational style. There is some evidence that family-based interventions may reduce alcohol abuse or risk factors for substance use [21].

Community action: Community actions are purposeful efforts in a community setting to influence the way in which people drink or think about drinking. Most community-based programmes combine means of reaching individuals in a catchment area and policy changes in the environment. Community-based programmes to prevent alcohol consumption do not have a substantial impact on their targets, although some effect can be obtained [5]. Community- based programmes tend to reduce drunken driving and accidents in particular.

Mass media campaigns: Most research on the effects of mass media campaigns is flawed by major methodological problems. Only a few controlled studies on the effectiveness of public campaigns about drinking exist. Research suggests that campaigns have no impact on self-reported drinking; however, limited effects on beliefs and attitudes have been reported. When the campaigns were supplemented by interpersonal and policy-focused interventions, they may have contributed to behavioural change [16].

Brief interventions: In most Western societies, a large proportion of persons drink more than the recommended limit of alcohol, which is 20g of alcohol or two standard drinks per day for men and 10g of alcohol or one standard drink per day for women [22]. It is important to identify the persons who are 'at risk'. A number of instruments for screening 'at-risk' drinkers have been tested and validated in clinical settings and health care practices and been found to have high sensitivity and specificity. If the results of screening and assessment indicate that a patient is at risk, a brief intervention by the health care provider can significantly reduce alcohol use and associated problems [23]. A substantial number of studies indicate that brief interventions are effective means for reducing a person's alcohol use and problems with alcohol [24]. Various protocols for brief interventions exist, but all essentially consist of providing advice and counsel-

Effectiveness of school programmes to prevent alcohol consumption

Concept of intervention	Effectiveness*
Information dissemination	**Not effective**
Affective education	**Not effective**
Social influences approach - Psychological inoculation - Correcting normative expectations - Resistance skills training	**Slightly effective**
Integrated social influence/social competence enhancement approach	**Slightly effective**

* Effectiveness of the intervention if used in isolation.
If the intervention is part of a comprehensive approach, the effectiveness might increase.

ling. Interestingly, research suggests that simple advice may be as effective as brief counselling [25].

Warning labels on beverage containers: The impact of labelling beverage containers with warnings about the effects of alcohol on health has been assessed in several states of the USA, with mixed results. Most of the evidence suggests no change in the perception of risk and no change in behaviour, although pregnant women showed some decrease in self-reported drinking 7 months after the introduction of warning labels [26].

Restrictions on advertising: The globalization of the media and markets is increasingly shaping young people's perceptions, choices and behaviour. Many young people today have greater opportunities and more available income, but they are probably more vulnerable to selling and marketing techniques. The results of research on the effects of alcohol advertising are mixed and not fully conclusive. Nevertheless, alcohol is a heavily advertised product, and the dominant themes are wealth, prestige and success. This may have long-term effects on attitudes and behaviour, which, empirically, are difficult to measure. Recent research suggests some impact of restrictions on advertising [5].

Missing information and research topics

A large body of scientific evidence has shown that certain preventive strategies are effective and can offset health and social costs. The long-term effectiveness of these services must be monitored. Remarkably few cost–benefit or cost–effectiveness studies based on formal quantitative methods have been reported in the area of prevention. Even more striking, few studies on implementation of prevention have been carried out, with the result that we have fairly good knowledge about how to prevent alcohol-related problems but we are unable to implement the corresponding strategies.

European Code Against Cancer

If you drink alcohol, whether beer, wine or spirits, moderate your consumption to two drinks per day if you are a man or one drink per day if you are a woman.

http://www.cancercode.org/ [22]

Conclusions and recommendations

NGOs should act primarily as 'pressure groups' or 'lobby groups'. As informed, effective advocates, they have a role to play in agenda-setting and message development. NGOs also can help to build up a network of individuals and organizations to share ideas, information and resources to promote common preventive goals. They can also function as fora for a multidisciplinary approach to health that includes not only members of established health professions. Their actions can be set at various levels: micro-policy (regional programmes, getting a regional court to accept a law), macro-policy (changing government strategies, monitoring industry behaviour) and norm setting (as 'moral entrepreneurs').

The alcohol industry has set up organizations to offset issues that might be detrimental to their business. They attempt to influence the alcohol and tobacco policy of national and international governmental organizations. Independent NGOs have a specific role to safeguard effective alcohol policies and to monitor the industry's behaviour. NGOs should inform and mobilize civil society about tobacco and alcohol-related problems, lobby for implementation of effective policy at government level and expose harmful actions of the industry. Great vigilance and effective monitoring of industry behaviour are needed.

According to the current recommendations of the World Cancer Research Fund, consumption of alcohol is not recommended. For people who do drink alcohol, there is a general consensus among the International Agency for the Research on Cancer, the World Health Organization, the European Code Against Cancer, the World Cancer Research Fund and many other organizations that intake should be limited to no more than two standard drinks per day for men and one standard drink per day for women.

The concept of a standard unit is, however, something of an oversimplification. The measure of 'one unit' of alcohol varies by country, consisting of 8g, 10g or 12g. It also varies according to the 'standard' measure used: for example, a glass of wine may contain 114–432 ml, although a spirit measure has now been standardized across Europe at 25 or 35 ml. Additionally, many beers and lagers are sold in cans of different volumes. The strength (alcohol content by volume) of a drink should be taken into account when estimating alcohol intake or the number of 10g units [27] (see illustration).

Alcoholic beverage volume containing 10 g of alcohol (one unit)

Calculating the alcohol content of a drink

% alcohol by volume (ABV) x specific gravity of alcohol (0.78) = grams of alcohol/100 ml

e.g. 13% ABV red wine x 0.78 = 10.14 g of alcohol per 100-ml glass

Calculating the number of 10 g units of alcohol per container

$$\frac{\%\ \text{ABV} \times \text{volume (ml)}}{1000}$$

e.g., for red wine, 13% ABV x 750-ml bottle

$$\frac{13 \times 750}{1000} = 9.8 \text{ units of alcohol}$$

Source: Medical Council on Alcohol [27]

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Occupational exposures

Occupational cancers can represent a substantial proportion of cancers among blue-collar workers. The effects of interventions are difficult to calculate because of the long latency between exposure and disease occurrence, changes in background incidence and mortality over time and difficulties in assessing exposures. Currently, only five carcinogenic substances-asbestos and four aromatic amines (ß-naphthylamine, benzidine, 4-aminobiphenyl and 4-nitrobiphenyl)-are banned in the European Union, but a long list of carcinogenic chemicals are labelled and subject to restricted use.

Despite a general decrease in exposure, regulations are not always well enforced, and workers are rarely given full legal redress for exposure.

NGOs can help fight hazardous occupational exposure by lobbying and pressuring national governments to ensure health and safety at work, and supra-national bodies to set requirements for workers' protection in all trade and investment agreements.

NGOs can encourage research on carcinogens in the work setting and collaborate with trade unions to increase workers' knowledge and awareness about carcinogens at work and prevention measures.

Occupational exposures

Franco Merletti and Dario Mirabelli
Unit of Cancer Epidemiology, University of Turin and Center for Oncologic Prevention, Turin, Italy

Complex occupational exposures were among the first causes of cancer to be identified. In some cases, this led to the identification of specific causal agents. Thus, the study of occupational cancers offered precious insights and paradigms for cancer epidemiology in general. This review focuses on agents that evidence indicates are carcinogenic to humans. Tables 1 and 2 list agents established as causes of occupational cancer and occupations for which there is sufficient evidence of increased cancer risk [1].

Occupational exposures and cancer: scientific evidence for disease etiology

Estimating the risk of a population exposed to agents such as those listed is difficult because: (i) the precise number of workers exposed to a given compound is not known; (ii) the degree of exposure necessary to increase cancer risk is also not known; and (iii) the distribution of degrees of exposure among the working population is often based on scanty data. CAREX is an international information system on occupational exposure to known or suspected carcinogens, established with support from the Europe Against Cancer programme of the European Union [2]. It has provided estimates of the numbers of exposed workers by country, industry and agent, including data for 139 agents evaluated by the International Agency for Research on Cancer (IARC) and for 55 industries classified according to the International Standard Industry Classification (revision 2). In 1990–93, occupational exposures to these agents were estimated for the 15 Member States of the European Union. About 32 million workers, i.e. 23% of

Table 1

Agents, groups of agents and mixtures to which there is occupational exposure and for which there is sufficient evidence of carcinogenicity (Group 1 carcinogens)

Agents and groups of agents[1]	
Aflatoxins, naturally occurring	Radioiodines, short-lived isotopes, including iodine-131, from atomic reactor accidents and detonation of nuclear weapons (exposure during childhood)
4-Aminobiphenyl	Radionuclides, α-particle-emitting, internally deposited (NB: Specific radionuclides for which there is sufficient evidence for carcinogenicity to humans are also listed individually as Group 1 agents)
Arsenic	Radionuclides, ß-particle-emitting, internally deposited (NB: Specific radionuclides for which there is sufficient evidence for carcinogenicity to humans are also listed individually as Group 1 agents)
Asbestos	Radium-224 and its decay products
Azathioprine	Radium-226 and its decay products
Benzene	Radium-228 and its decay products
Benzidine	Radon-222 and its decay products
Beryllium	Silica, crystalline (inhaled in the form of quartz or cristobalite from occupational sources)
Bis (chloromethyl) ether and chloromethyl methyl ether	Solar radiation
1,4-Butanediol dimethanesulfonate (Busulphan; Myleran)	Talc containing asbestiform fibres
Cadmium and cadmium compounds	Tamoxifen
Chlorambucil	2,3,7,8-Tetrachlorodibenzo-*para*-dioxin (NB: Overall evaluation upgraded from 2A to 1 on the basis of supporting evidence from other data relevant to the evaluation of carcinogenicity and its mechanisms)
1-(2-Chloroethyl)-3-(4-methylcyclohexyl) -1-nitrosourea (methyl-CCNU; Semustine)	Thiotepa
Chromium[VI] compounds	Treosulfan
Ciclosporin	Vinyl chloride
Cyclophosphamide	X- and γ-radiation
Ethylene oxide	**Mixture[2]**
Etoposide	Coal-tar pitches
Hepatitis B virus (chronic infection with)	Coal-tars
Hepatitis C virus (chronic infection with)	Mineral oils, untreated and mildly treated
Human immunodeficiency virus type 1 (infection with)	Shale-oils
Melphalan	Soots
8-Methoxypsoralen (Methoxsalen) plus ultraviolet A radiation	Tobacco smoke
MOPP and other combined chemotherapy including alkylating agents	Wood dust
Mustard gas (Sulfur mustard)	
2-Naphthylamine	
Neutrons (NB: Overall evaluation upgraded from 2B to 1 on the basis of supporting evidence from other data relevant to the evaluation of carcinogenicity and its mechanisms)	
Nickel compounds	
Phosphorus-32, as phosphate	
Plutonium-239 and its decay products (may contain plutonium-240 and other isotopes), as aerosols	

1 The only biological agents included are human immunodeficiency virus and hepatitis viruses B and C. Therapeutic hormones are not included, although exposure during their production is possible; anticancer and immunosuppressive drugs are included. Erionite and thorium[IV] are not included.

2 Tobacco smoke is included in view of the relevance of environmental tobacco smoke at work.

the work force, were exposed to agents included in the CAREX system, with some 42 million episodes of exposure. The most common exposures were: solar radiation (9.1 million exposed workers), environmental tobacco smoke (7.5), crystalline silica (3.2), diesel engine exhaust (3.0), radon (2.7), wood dust (2.6), lead and inorganic lead compounds (1.5), benzene (1.4), asbestos (1.2), polynuclear aromatic hydrocarbons (PAHs) (0.98) and hexavalent chromium and compounds (0.8).

Caution must be exercised in estimating the magnitude of the occupational cancer problem, even when assessments of exposure are available, as from CAREX. There is general agreement in the scientific community that this is an area of uncertainty. Estimates are difficult to make because they depend on the proportion of the population exposed and the magnitude of the risk of those exposed. As mentioned above, both figures are difficult to obtain and are site-, space- and time-specific. It is therefore not surprising that somewhat different attributable risks have been estimated in different studies. Vineis and Simonato estimated [3] that 2–24% of cases of urinary bladder cancer in men could be due to their occupation, the wide range covering different areas in western industrialized countries; for lung cancer, they reported a range of 6–35%, from studies in which exposure was assessed from a job–exposure matrix. A recent estimate of the attributable risk for lung cancer among residents of a large, industrial Italian town was in the order of 10% [4].

Occupational cancers are particularly important because they represent a substantial proportion of cancers in specific subgroups of the general population. So, if 3% of deaths from all cancers in the general population are due to occupational exposure, that would correspond to 12% in the broad category of blue-collar workers. Furthermore, occupational carcinogens are among the few agents amenable, in theory, to regulatory control.

Epidemiological evidence is available, or could be provided in appropriate studies, for the possible elimination of the risks associated with exposure to the agents listed in Tables 1 and 2.

Perhaps one of the best examples of effective control of occupational cancer risks is control of exposure to ionizing radiation in nuclear electricity production. Even though one study showed an elevated risks for leukaemia [43], studies of large industrial cohorts showed no excess risk for death from leukaemia or solid cancers. It has been suggested that the cancer risk is reduced, but not completely eliminated, at currently permitted levels of exposure [44]. Furthermore, it has been suggested that other, more subtle and elusive cancer risks, namely in workers' offspring, might be due to exposure at current levels [45].

Table 2

Occupational exposure circumstances for which there is sufficient evidence of carcinogenicity (Group 1 carcinogens)

Aluminium production
Auramine, manufacture of
Boot and shoe manufacture and repair
Coal gasification
Coke production
Furniture and cabinet making
Haematite mining (underground) with exposure to radon
Iron and steel founding
Isopropanol manufacture (strong-acid process)
Magenta, manufacture of
Painter (occupational exposure as a)
Rubber industry
Strong-inorganic-acid mists containing sulfuric acid (occupational exposure to)

Occupational risks and exposures

In the **nickel refining industry,** the excess risks for nasal sinus cancer and lung cancer appear to have been greatly reduced after changes in the manufacturing process [5,6], but the exact nature of the carcinogenic agent has never been established. Various nickel compounds are estimated to have been present in work-room air [7], but cancer has been associated with the earliest stage of refining, which involved heavy exposure to dust from relatively crude ore. Few details are available about the changes that could have contributed to lowering the cancer risk [6].

The use of **arsenic-containing insecticides and fungicides** was discontinued in many countries in the mid- to late 1970s, with stringent restrictions on levels of arsenic residues in surface water and groundwater intended for provision of drinking-water, in food items and in animal foodstuffs. In some countries they have been banned [8]. Population-based case–control studies of lung cancer have shown excess risks among farmers potentially exposed to arsenic-containing pesticides [9,10].

Use of **asbestos and asbestos-containing materials** and products has recently been forbidden in some European countries; a European Union Directive established a ban that is still not fully implemented by all Member States. In the USA, exposure to asbestos at work is strictly controlled, and the asbestos industry has moved its activities to other countries. On the basis of models in which age, period and cohort are adjusted for, the epidemic of malignant mesotheliomas is expected to fade away in the USA and the European Union, but not before the late 2010s or 2020s [11,12]. No similar models have been designed to estimate how the burden of asbestos-related lung cancer will decline over time. Asbestos-related lung cancer may account for as much as 5.7–19% of cases among men, as indicated by the results of case–control studies conducted in various areas of Finland, Italy, Norway, Sweden and the United Kingdom]13]. This is not surprising, considering that 20–25% of men born in 1920–49 were occupationally exposed to asbestos [14]. The most heavily exposed cohorts (born in 1940–49 and 1950–59 in France) are still too young to have experienced the full consequences of their past exposure. Therefore, it is currently impossible to observe any reduction in the incidence of asbestos-related cancers, let alone in deaths from this cause. The burden of asbestos-related cancers might in fact increase worldwide because of intensive industrial activity in countries where asbestos use is not legally constrained and exposure control strategies are not implemented [15].

The effect of improved working conditions on the risk for urinary bladder cancer was studied in a **benzidine manufacturing** factory in the USA [16], where in 1955 a fully enclosed, wet process for benzidine sulfate production was used. Among workers employed at any time before 1955, 115 cases of bladder cancer were observed, including 36 cases among workers exposed only to benzidine; no cases were observed among those employed only after 1955. The evidence from this study is limited, however, due to the fact that bladder cancer may have an induction or latent period longer than 20 years.

In the United Kingdom, production and use of **ß-naphthylamine, 4-aminobiphenyl and benzidine** was discontinued in the early to mid-1960s and was then banned by the Carcinogenic Substances Act, 1967; Japan, the USA and some European countries followed suit in the mid-1970s. Use of these substances as intermediates in the production of colouring agents was stopped a few years later but was continued in other countries, including Brazil, China, India and eastern European countries [17]. Population-based case–control studies might show a reduction in the proportion of bladder cancer cases attributable to exposure in industries in which colouring agents are produced or are heavily used, such as in textile dyeing. A reduction could be expected only, however, if non-carcinogenic substitute colouring agents are used, and production of banned agents is not continued in developing countries, followed by re-importation of their derivatives.

The risk for bladder cancer in the **rubber and cable-making** industry was thought to be due to the presence of certain α-naphthylamine antioxidants containing trace amounts of ß-naphthylamine; their use was discontinued in 1949. Early follow-up of cohorts in the British rubber industry often reported no excess deaths from bladder cancer among workers first employed after 1949 [18–20]. As in the study of Ferber et al. [16], however, the evidence for risk eradication was limited by the long latency of bladder cancer and by the low sensitivity of mortality as an indicator of occurrence. Furthermore, evidence of a persisting risk was found in some studies conducted in other countries [21,22]. The production and use of α-naphthylamine and of phenyl-ß-naphthylamine were discontinued owing to concern about their contamination with ß-naphthylamine in the late 1980s in the USA and in the European Union, where substitutes based on mixtures of aryl-para-phenylenediamines were and are currently produced; however, these are known to be contaminated with ortho-toluidine, and diphenylamine and its derivatives may be contaminated with 4-aminobiphenyl. Failure to eliminate completely workers' exposure to carcinogenic aromatic amines may explain the persistent observation of an increased risk for bladder cancer in the rubber industry worldwide [23–26], as well as in certain chemical plants [27].

Modern **lubricating oils and cutting fluids** are produced with mineral oil bases obtained from oil, rather than from coal, and the bases are strongly refined [28] by processes that reduced their PAH content. The most recent machining fluids are synthetic and have no mineral oil base. The risk for skin cancer among workers in mechanical and textile industries, still seen in the 1950s [29], has substantially disappeared as a topic from the occupational health literature. It is less clear, however, whether the risks for cancers at other sites have been as successfully controlled; there is evidence that deaths from cancers at sites such as the larynx, rectum, bladder and, to a lesser degree, colon, prostate and nasal sinuses, are still associated with work in the mechanical industry, in jobs that entailed exposure to cutting fluids and lubricating agents [30]. Furthermore, certain mineral oil refining processes resulted in substantial quantities of mineral aromatic extracts rich in PAHs, and these have been widely used since the 1950s as extender oils in the rubber industry, perhaps explaining the increased lung cancer risk currently observed in that industry [23,25]. Asphalts with a low content of PAHs have become available for use in road-paving and in the construction industry in general. Thus, certain exposures are reduced [31], but there is only limited epidemiological evidence for a corresponding reduction in cancer risk [32,33].

Benzene has been established as a cause of leukaemia, and less certain associations with multiple myeloma and non-Hodgkin lymphoma have been proposed [34,35]. These findings refer to exposure in the 1950s and 1960s, and the considerably lower exposure levels in the petrochemical industry have not been associated with an overall, industry-wide increase in mortality from leukaemia, multiple myeloma or lymphoma [36–38]. Other studies have, shown increased mortality rates from leukaemia and lymphoma among benzene-exposed workers [39]; however, they were carried out in settings where high levels or a wider range of levels were probably present, as can be inferred from the fact that some cases of aplastic anaemia were recorded.

Environmental tobacco smoke is the second most widespread carcinogen at work, according to the CAREX estimates [2]. Furthermore, there is evidence of an interaction between active smoking and occupational exposure, mainly to asbestos [40,41]. Control of tobacco smoking at work is therefore relevant for both actively and passively exposed persons, and work places have indeed been used as suitable environments for promoting smoking cessation [42].

Results of effective interventions

The only systematic review available on the effects of interventions to control exposure to occupational risks is a recent review on the rubber industry [23], which took into account changes in overall technology and chemistry and evidence for the persistence of previously observed cancer risks. This review is useful for identifying the difficulties encountered in gathering evidence of effectiveness in occupational cancer prevention.

- The long latency of most human cancers means that conclusions cannot be drawn from observations made soon after changes have been introduced. Workers first employed after implementation of an intervention are not yet at risk, or fully at risk, of developing the disease, because the latency has not expired.
- Very long-term observations are difficult to conduct, and they are difficult to interpret because of changing patterns in the incidence of and mortality from the disease of interest and possible complex interactions with other exposures.
- The characteristics of exposure are often poorly understood and recorded, so it may be impossible to assess the quantitative relationship between exposure and disease, which is precisely what is needed when exposure is reduced but the agent is not eliminated. Sometimes, the nature of the relevant exposure is not understood, so that a carcinogenic agent may be withdrawn but its substitutes may be as dangerous, or almost as dangerous. Both industry-based and population-based epidemiological studies have major limitations with regard to exposure assessment, owing to a lack of suitable data. This is the origin of major uncertainties and controversies in the interpretation of epidemiological evidence.

This picture shows why it is difficult to obtain evidence of a reduction in cancer risk after the adoption of control measures and why reports of such evidence are rare.

Within the limits of the above-mentioned uncertainties, it can be concluded that workers' exposure to carcinogens in industrialized countries is still not controlled as completely as it should be. Some widespread occupational cancer risks [29] or carcinogenic exposures seem to have disappeared or to have been significantly reduced in industrial and agricultural settings in Europe and the USA. Nevertheless, some substitute agents now appear to entail the same risks as the agents they replaced, and some carcinogenic contaminants eliminated from agents in certain industries have been introduced into agents used in other processes. Risk can be only partially eliminated when the relevant exposure is to a complex mixture rather than to simple chemicals [46].

Extension of the European Union regulation on classification, labelling and packaging of dangerous substances to carcinogens might play an important role in prevention. Its main limitation is that carcinogens in by-products, decomposition and combustion products or trace contaminants fall outside the provisions of this regulation.

A critical issue, is the continuation of production processes entailing exposure to carcinogens in developing countries, where there is often little experience in the management of industrial hazards and limited power to enforce sound control strategies [15].

Methods and characteristics of effective interventions to reduce exposure and risk factors

In appraising the limited evidence of risk reduction after interventions to control occupational exposures to carcinogens, consideration must be given to the problem of who should bear the burden of proof and what the proof should consist of: evidence of benefit from the intervention or evidence of harm from the exposure. Occupational exposure is imposed on individuals, who have little, if any, personal choice, freedom or responsibility for accepting or avoiding the exposure and often lack the basic necessary knowledge. As a consequence, the burden of proof to demonstrate that a production process is safe is on the employer. Evidence that an exposure may be harmful is sufficient to require intervention to eliminate it.

Primary prevention of exposure to carcinogens at work is based on application of fundamental industrial hygiene strategies. These include:

- substitution with agents intended to be less dangerous,
- fully enclosed processing and strict control of exposure, e.g. by reducing the amounts used, local exhaust, personal protection and cleaning practices.

The aim of these strategies is to reduce or, ideally, eliminate both the number of exposed workers and their exposure level. Exposure is best controlled by embedding control strategies in projects for factories and processes, ensuring protection of both workers and neighbouring communities. Strategies for eliminating exposure to tobacco smoke in the work place include preventive interventions such as smoke-free policies and individualized programmes.

At local and national levels, primary prevention involves the adoption of regulations to facilitate preventive measures or to enforce them. The first country to forbid the manufacture of certain chemicals because of their carcinogenicity was the United Kingdom, with its Carcinogenic Substances Regulations 1967 which banned β-naphthylamine, benzidine, 4-aminobiphenyl and 4-nitrobiphenyl. A European Union regulation on carcinogens at work was initiated with Directive 90/394/EEC, but the only carcinogenic agents for which production and use are forbidden, apart from asbestos, are the same four as in the United Kingdom Carcinogenic Substances Regulations. Chemical carcinogens are, however, listed, classified and labelled according to a specific Directive, and the labelling is followed by a number of restrictions on their use. The list from the IARC Monographs programme [1] comprises a broader range of agents of occupational interest, including not only chemicals but also physical and biological agents and exposure circumstances.

Access of workers to information about their exposures and the risks they entail is fundamental. It is the first step in empowering them to verify that appropriate measures have been taken. The European Union regulations on carcinogens at work require that specific information be given to workers exposed to carcinogens, including special instructions on how to deal with accidents and emergencies.

As all European Union Member States should by now have adopted the regulations, their enforcement by technical public

Regulating exposure to carcinogens

Asbestos and certain aromatic amines were banned long after their dangers were first recognized. The excess risk for urinary bladder cancer due to exposure to aromatic amines was known for almost 70 years before the United Kingdom Carcinogenic Substances Regulations were adopted in 1967. The very high risks associated with exposure to asbestos were known for almost 50 years [50] before adoption of the ban on this substance by the European Union [51].

Very few countries and none in the developing world have adopted regulations to ban carcinogens. Some countries have even tried to block the limited advances, in order to defend the interests of national industries, appealing to supranational organizations like the World Trade Organization, on the grounds of free markets [52]. Many industries in which carcinogens are used and which were formerly located in countries that have adopted restrictive regulations have been moved to developing countries, often without restraints from the countries of origin or their controlling corporations.

The high levels of exposure to carcinogens that existed in the past [53] have decreased over the past few decades in the wealthiest countries, as can be inferred from the general trend to decreasing legal limits (threshold limit values) for chemicals, including carcinogens [54]. Nonetheless, progress has been slow. Furthermore, prevention strategies have been applied with difficulty, sometimes with open opposition from interested industries [55–57]. In general, regulations have been minimally enforced by public health authorities, and workers' cases in court litigations have received little consideration.

services specialized in inspecting work places is the next key issue. Workers should have legal redress, not only when they are affected by work-related conditions but also just because they are exposed; their cases should be settled fairly. This does not, however, appear to be the case currently, even in large Member States [47].

Identification of particularly susceptible individuals currently has no scientific ground, and may lead to discrimination, particularly when based on genetic screening [48,49].

Missing information and research topics

Information on the production and use of carcinogens of occupational interest is still limited. The International Labour Office Convention No. 139 of 1974, concerning the prevention of occupational hazards from carcinogens, recommended the establishment of registries of workers occupationally exposed to carcinogens.

The establishment of registries of exposed workers under the provisions of the European Union regulations would help epidemiological surveillance considerably, allowing linkage with mortality and morbidity records. Their usefulness would be even greater if exposure were assessed and recorded quantitatively.

Generalized inquiries about occupational exposure in industry, such as the surveys of the National Institute for Occupational and Safety (USA) in the mid-1970s and mid-1980s [58], were not repeated in the 1990s. Updating of the CAREX initiative in Europe is not currently being considered. Registration of exposure to carcinogens should be mandatory in all European Union Member States, under the provisions of Directive 90/394/EEC. Unfortunately, the Finnish registry [2] is the only currently working system.

The amounts of chemicals, including carcinogenic substances, produced or imported yearly in the Member States of the European Union are recorded, but their uses are not. The European Union regulation on carcinogens at work requires that exposures and exposure levels be systematically recorded at industry level in a 'risk assessment document'.

Implementation of this measure could in future provide the data needed to monitor time trends in exposure and to assess the effectiveness of preventive intervention at this level and, eventually, of preventive policies. Monitoring would require coordinated data production and collection, at the initiative of public authorities or research bodies.

There is a considerable gap between our knowledge of the carcinogenic properties of chemicals and the large number of substances used in industry: most have either never been tested or not adequately assessed. Recent reductions in the number of laboratories available for animal experimentation and in the funding of experiments on animals may further widen the gap. Furthermore, there appears to be a trend to conduct epidemiological studies on agents that have already been investigated and to neglect new substances [54]; even agents suspected of being carcinogenic on the basis of data from animal experimentation are rarely studied.

The tendency of laboratories to switch to more exciting areas, such as genomics, and the greater likelihood of funding for extending existing epidemiological studies than for studies in new areas help to explain this gap in knowledge. Funding bodies for public health programmes should reconsider their priorities and policies if these trends are to be reversed. Molecular epidemiology could be used to identify new carcinogenic hazards, by reducing the latency between exposure and effect, reducing the number of observations needed to detect significant increases at certain end-points and providing clues for mechanisms of action. No agreement has yet been reached, however, on the interpretation of findings at molecular end-points in the absence of epidemiological evidence.

No procedure for screening workers for cancers at sites consistently linked to occupational exposure to carcinogens can currently be recommended, apart from experimental programmes in planned trials. Spiral-computed scanning for early detection of lung cancer is currently being investigated. If this technique proves useful, the access of workers formerly exposed to lung carcinogens such as asbestos, chromium and nickel to screening and treatment will become an issue of primary importance in the public health agenda.

Conclusions and recommendations

The European Union could play a pivotal role in promoting international cooperation in reducing occupational exposures. Its regulations of the classification, labelling and packaging of dangerous substances provide a good example of active cooperation, as the requirements are the same for countries within and outside the European Union.

Scientific knowledge should be translated without undue delay into appropriate interventions. Displacement of hazardous activities to countries where there is less protection and where there are double standards for the protection of workers and the environment should be strongly discouraged.

Key areas of research that should be funded increasingly by public bodies in the framework of internationally coordinated efforts include:

- identification of hazards (carcinogenic substances) by systematic experimental studies and epidemiological studies of populations exposed at work;
- dose–response assessment, through:
  - improved exposure assessment methods in cohort and case–control studies,
  - improved modelling for quantitative extrapolation of experimental data to humans;
- exposure description, by:
  - systematic documentation of the prevalence of exposure across countries and of time trends,
  - systematic registration of exposed workers,
  - systematic documentation of down-stream uses of substances and industrial materials, to control for exposure outside of (controlled) work settings.

In this general framework, NGOs can play a role in many areas, including:

- putting pressure on supranational bodies such as the European Union and the World Trade Organization to ensure adequate emphasis on protection of workers and the environment when setting regulations, especially those aimed at ensuring market and investment freedom;
- funding experimental and epidemiological research on the carcinogenicity of chemicals at work;
- promoting and funding surveys on the extent and level of exposure to carcinogens and on the results of implemented preventive interventions;
- requiring accountability of public national organizations in charge of ensuring health and safety at work by law enforcement or by promotion of higher protection standards;
- promoting professional and public debate on the state of workers' protection; and
- cooperating with trade unions to increase workers' awareness and knowledge about carcinogens at work and the availability of preventive measures.

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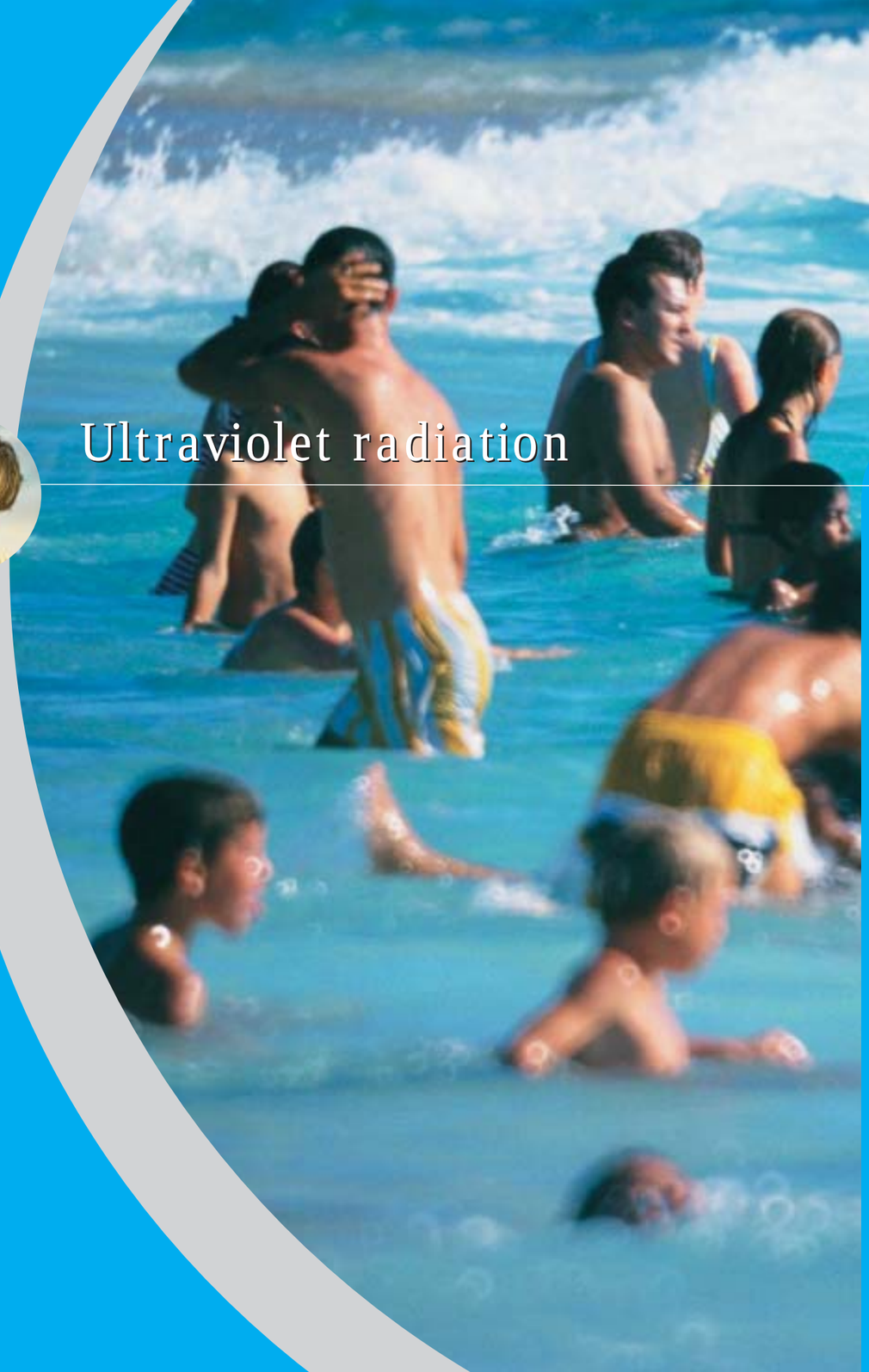
Programmes for preventing exposure to the sun have increased awareness in the targeted populations, and the results indicate that moderate changes had been achieved in attitudes to sun protection. In Australia, where the largest campaigns were conducted, a decrease in the incidence of skin cancer was observed after 15 years of intervention.

Early detection campaigns (both screening and early diagnosis) have also increased public awareness and have improved the diagnostic capability of health professionals. This led to a decline in the severity of skin melanoma, with a large increase in the median survival time of these patients. The efficiency of mass screening programmes has not, however, been fully demonstrated.

A faster, more efficient decrease in deaths from melanoma could be obtained by improving awareness of the availability of early diagnosis. Furthermore, the incidence of skin cancer could be reduced by comprehensive preventive interventions directed at children and adolescents.



Ultraviolet radiation

Ultraviolet radiation

Hélène Sancho-Garnier, Christine Defez and Anne Stoebner-Delbarre
Epidaure, Department of Epidemiology and Prevention, Regional Cancer Centre Montpellier, France

Ultraviolet radiation and cancer: burden of disease and established risk factors

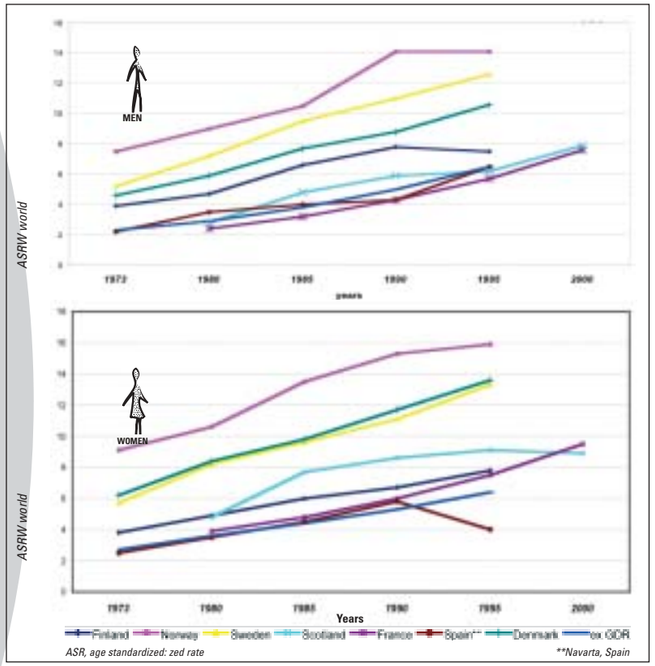
The two main types of skin cancer are carcinoma and melanoma. Carcinomas are the most frequent (standardized incidence rate in Europe, 30-100 cases per 100,000 population) but are rarely life-threatening. Melanomas are relatively rare (standardized incidence rate in Europe, 5–15 per 100,000), but their evolution can be lethal. The incidence of skin cancer has increased dramatically over the past 50 years in white populations (see Figure 1). Of several risk factors for skin cancer that have been identified, exposure to ultraviolet (UV) radiation is the foremost [1]. Other risk factors are ionizing radiation and certain chemicals (arsenic, coal-tars and mineral oils), generally encountered occupationally (see chapter on Occupational exposures). These environmental factors interact with different skin phenotypes (see box) to result in different risks.

Skin phenotypes

Type	Burn	Tan	Hair colour	Eye colour
I	Always	Never	Red or blonde	Light
II	Always	Lightly	Blonde or light brown	Light
III	Sometimes	Always	Blonde or brown	Any
IV, V	Rarely	Always	Brown or black	Brown or black

Figure 1

Time trends in the incidence of skin melanoma



The relationship between exposure to UV radiation, skin phenotype and skin cancer can be summed up as follows [2–5]:

- The risk for basal-cell carcinomas is greater (relative risk, 2–3) among persons of light skin phenotype with poor ability to tan and for those exposed to UV radiation in childhood.
- People susceptible to spinocellular carcinomas are those with phenotypes that make it impossible to tan and a basal pigmentation level, particularly red hair and fair skin. Length of exposure also plays an important role. The relative risk varies from 3 to 7, depending on the associations between these factors.
- Convincing evidence is available with regard to a causal role of UV radiation in the generation of melanomas in people with sensitive skin phenotypes (fair skin, little ability to tan). The risk increases with exposure to the sun in infancy (relative risk, 3–5) [5].

Skin cancer can be diagnosed early by simple visual examination. The number of melanoma-related deaths is proportional to the stage of development of tumours, particularly to the thickness of the lesion. Thus, the 5-year survival rate is greater than 95% for lesions less than 0.76 mm thick, 44% for lesions more than 4 mm thick, 30% for nodular (very thick) melanoma and 10% for metastatic melanoma [6].

The other types of skin cancer rarely lead to death, but early diagnosis could reduce the associated morbidity and cost. Basal-cell carcinomas grow slowly, but a late diagnosis could result in large, extended forms that are relatively inaccessible to treatment [7]. Spinocellular carcinomas are easily detected by the presence of precursor lesions such as actinic keratosis; their development is progressive. In the absence of treatment, metastases appear in about 2% of cases [8].

Ozone

The amount of UV radiation that reaches the Earth's surface varies according to the solar zenith angle, the column of ozone and its vertical distribution, gaseous and particulate air pollution, atmospheric aerosol load and cloudiness. A systematic variation in any of these factors would result in a trend. Estimates of the increases in skin cancer incidence that could result from predicted reductions in stratospheric ozone lack a well-founded numerical basis. The Intersun study has been planned to quantify the relationship between ambient solar radiation and the occurrence of health effects, but the results are not yet available [51].

Programmes to reduce exposure to the sun

The programmes

This review was based on an analysis of 27 studies published between 1982 and 2002, 12 of which were randomized controlled trials. Five of the other studies were not randomized but included a control group, and 10 had no control group.

The sun protection programmes were carried out at either a wide (city, region or country) or a restricted community level (schools, professional milieu) or for specific populations (e.g. travellers, mothers of newborns). The aim of all the programmes was to change the knowledge, attitudes, intentions and behaviour of the target populations with regard to exposure to the sun.

The methods essentially comprised dissemination of information through the media (radio, television and the press) or distributing tools such as comic strips, CD-ROMs, videos, brochures and slides, as well as sun protection promotional items [10–31].

> "A high risk strategy for melanoma prevention might seek to identify and target individuals with three or more risk factors (such as a number of moles, blonde or auburn hair, previous sunburn, and a family history of skin cancer). However, only 24% of cases of melanoma occur in this 9% of the population, so a targeted approach would succeed in identifying those at high risk but would do little for population levels of melanoma – 75% of cases occur in the 58% of the population with at least one risk factor. A population-wide strategy would seek to make sun protection a social norm, so that the whole population is less exposed to risk."
>
> **Source: World Health Organization [9]**

In some programmes, sun protection devices were also distributed, including parasols, hats, sunscreens and one-piece bathing suits [14, 17, 21, 23, 32]. In the professional milieu, staff training sessions were conducted, in the form of 30-45 minutes conferences [33] or 3 hours health education sessions [34].

The intervention tools and assessment methods differed from one study to the other. Most involved self-administered questionnaires or telephone interviews to assess knowledge, attitudes and intended behaviour. Nine authors validated their scales [12,23,25,26,30,32,33,35,36]. Others evaluated the incidence of naevi and freckles after the start of the programme. In a school-based study, real sun protection behaviour was assessed by observation.

The impact of the programmes was assessed either immediately afterwards or after a relatively long time. One-half of the studies included an assessment period of 2–4 months; the longest period was 4 years.

Impact of the sun protection programmes

Increased knowledge: All the studies showed a marked increase in knowledge scores immediately after programmes lasting 1–28 weeks among children and adults. The increase in knowledge appeared to be greater among the youngest children. The only study conducted in a nursery school showed a significant increase in scores for knowledge and understanding of the message 2–7 weeks after the programme [29]. Studies among primary school children also reflected an increase in knowledge [20,22,26]. Hornung et al. [26] noted the advantages of an interactive CD-ROM programme over an educational standard supplemented with a skin cancer prevention module: the group receiving the latter intervention showed little difference from the group that had no intervention.

The studies carried out among junior high-school children showed an increase in knowledge scores [11,12]. Hughes et al. [11] observed that girls scored higher than boys. In their study, there was no significant difference between the four interventions tested: workbook ± leaflet ± video, design of a poster or discussion of the message. Among high school students [30], more knowledge was linked significantly to taking strong precautionary measures against the harmful effects of sunlight and more frequent use of sunscreens.

In studies on the staff of leisure centres on the island of Oahu in Hawaii [35] and the employees of an Australian electricity company who worked outdoors [33], considerably more knowledge was acquired by the intervention group than the control group 3 months and 1 year, respectively, after the intervention.

Changes in attitudes and opinions: Heterogeneous results were obtained for changes in attitude. Two studies showed no effect of the programme on attitude by the end of the evaluation period [26,33]. The other six studies had variable results [11,12,20,22,30,35]. The main outcome was a reduced preference for tanning. One study [20] showed a marked decrease in the frequency with which 9-year-old children in the intervention group wished to tan 4 months after the programme had ended. A similar change in attitude was noted in 11-year-old children [22].

Another attitude measured was perception of minor skin damage after exposure to the sun. Two months after a programme, junior high-school students were more concerned about their degree of sunburn and the need for protection [12].

Increased intention to practise sun protection: An analysis of the programmes' impact on the intention of participants to protect themselves from the sun produced contradictory results.

Five studies did not show any change in intention to practise sun protection at the end of the evaluation period [11,13,20,26,29], whereas three others registered an increase among participants in the programme [21,22,35].

In a study conducted in an Australian city [37], one-third of the people interviewed said that they had seen a television programme about the dangers of sunlight and the need to avoid sunburn, broadcast as part of the intervention, and the knowledge of people who had seen it was significantly better than that of those who had not. More than half said that better sun protection was necessary, but fewer than one-third said that beauty spots should be monitored. Almost 75% of people considered that the prevention programme was relevant to them.

Increased sun protection: None of the studies with controls evaluated the effect of a prevention programme on subsequent sun protection. In one observational study [22], use of protective creams and external sun protection measures (e.g., hats, clothing, shade, parasols), less exposure to the sun and reduced sunburn were reported. In another study [37], after the airing of a television programme, 60% of the people interviewed said that they protected themselves more from the sun, kept a close watch on their skin, consulted a doctor or warned other people about the danger of skin cancer.

The impact of other programmes was mixed. Bolognia et al. [21], for example, recorded an increase in use of sunscreens and a decrease in sun exposure but no change in the use of hats, parasols or protective clothing 6 months after the intervention. One study [32] highlighted a paradoxical effect: children who had participated in the programme subsequently exposed themselves more to the sun!

Effect on numbers of freckles and naevi: The only study in which the impact of a programme on the number of benign naevi and freckles was assessed did not show significant differences between the control group and groups receiving high and low levels of intervention (one-piece bathing suits and a specific educational programme delivered by teachers) after a 4-year programme for 6-year-old schoolchildren [32].

Clothes and clothes

All textiles do not offer the same protection! Synthetic fibres protect more than natural fibres. Protection against UV radiation depends on the spaces between the fibres and the density of the weave. Protection decreases when clothes are wet, light-coloured or stretched.

Special, chemically treated protective clothes are now available. A 'UV standard' logo has been created in some countries (e.g., Switzerland) to guarantee the protective power of cloth.

Sunscreens

Sunscreens are given a numerical indicator, the sun protection factor (SPF), which identifies the level of protection that can be expected from UV radiation. The classification is calibrated according to the degree of solar erythema (redness or sunburn) and not in relation to protection from skin cancer.

Sunscreens help individuals to avoid sunburn by allowing them to choose a SPF that corresponds to their own phenotype and to local sunlight intensity. In no case do they permit longer exposure, particularly for people who do not tan easily.

Two strategies are available to increase early detection:

- systematic examination of all individuals in a healthy, targeted population by professionals, i.e. 'screening' (five studies), and
- increasing the awareness of individuals and health professionals about early symptoms and making a diagnosis as quickly as possible when initial symptoms appear, i.e., 'early diagnosis' (eight studies).

The same detection test, 'a complete body visual examination', is used in the two strategies, but they differ in the size and type of population targeted. For screening, the entire population is targeted, regardless of cutaneous lesions. For early diagnosis, only subjects presenting with skin anomalies are included. The advantages and costs of these two approaches are different.

Programmes to increase early detection of skin cancer

The programmes

This review was based on an analysis of 13 studies published between 1990 and 2002: three in Australia, three in the United Kingdom, two in the USA, two in Italy, and one each in Canada, France and Switzerland. The main aim of all the programmes was to diagnose skin tumours, especially malignant melanomas, as early as possible. The effect of early detection was measured as increased knowledge, the sensitivity and specificity of self-examination by individuals and of diagnosis by health professionals, the number of skin cancers detected, the stage of the diagnosed tumours, the mortality rate and cost.

Early detection was optimized by:

- training and sensitization of health professionals (first-aid workers, nurses, general practitioners and dermatologists) and disseminating information through the media [38–47]; training lasted 2–40 hours;
- dissemination of information in a televised prevention campaign [37];
- training people in self-examination by various means, such as photography in association with a visual examination [48]; and
- establishment of a screening centre [49].

The number of tumours detected and their thickness, the predictability, sensitivity and specificity of the test, and the mortality rate were determined either from tumour registries or from data provided by a representative sample of anatomo-pathological laboratories in collaboration with health professionals. Both knowledge and diagnostic abilities were evaluated from self-administered questionnaires.

Impact of early detection campaigns (screening or early diagnosis)

Increased self-examination of the skin: In one study [37], 55% of the participants looked for spots on their skin after the programme was aired, and 28% found spots; 60% of the people interviewed said that they kept a close watch on their skin or had consulted a doctor.

Improved performance by health professionals: The two studies involving training in the professional environment led to a significant increase in knowledge. McCormick et al. [36] measured a global knowledge index among nurses concerning prevention, early diagnosis and educational abilities. Katris et al. [43] assessed the performance of nurses trained in the early diagnosis of lesions suspected to be malignant. Thus, 94.8% of lesions identified by surgeons as likely to be malignant were also identified by the nurses, and no melanoma was missed. The sensitivity of the clinical examinations conducted by the trained nurses was 95%, and the specificity was 84%. In the same study, the surgeon's work was reduced by an estimated 70%.

Mikkilineni et al. [46] evaluated the effect of a training course for first-aid workers. They found an increase in knowledge and an increased ability to differentiate between lesions and to make a precise diagnosis of skin cancer. The training also strengthened the professionals' confidence in their diagnosis.

A study conducted in 17 national insurance health centres in France showed a clear increase in the sensitivity and specificity of clinical diagnosis by trained as compared with untrained general practitioners [50].
Edmondson et al. [48] showed that taking a photograph during a clinical examination by a doctor increased the number of lesions diagnosed and had a reassuring effect for 59% of persons being examined.

Increase in number of skin cancers detected and reduction in melanoma thickness and mortality rate: Diffusion of information by the media can increase the number of patients seen each day by general practitioners or hospital doctors for a skin lesion [42]. It can also increase the number of tumour samples sent to anatomo-pathology laboratory (an additional 20% in the study of Theobald et al. [37]).

Six studies showed a considerable increase in the number of melanomas diagnosed after the campaign and a tendency towards a reduction in tumour thickness [36,39,40,42,44,47]. A significant decrease in the average thickness of melanomas was observed in two studies [36,47]. Other authors divided the thickness into two categories: MacKie and Hole [44] recorded more melanomas of less than 1.5mm, and Theobald et al. [37] registered a greater number of melanomas of less than 0.75mm in the 2 years after the programme. Bonerandi et al. [39], however, found an increase in the number of tumours of less than 1mm and a decrease in the number less than 3mm, but not to a significant extent.

The increase in the number of skin melanomas diagnosed during the months immediately after the campaign varied between 116% and 143% [36,40], and a fairly rapid decrease was noted over time. In one study [40], two screening campaigns doubled the number of melanomas detected over the next 2 months, whereas the increase did not rise above 20% during the subsequent 12 months. The effect on thickness also seemed to fade with time: Theobald et al. [37] found a significant decrease in thickness during the first year and no significant decrease beyond that time.

Solar UV index

The solar UV index (UVI) describes the level of solar UV radiation at the Earth's surface. The values of the index range from zero upwards: the higher the index, the greater the potential damage to the skin and eyes and the less time it takes for harm to occur. The maximum UV radiation is encountered 4 hours around solar noon. Depending on geographical location, solar noon is between local noon and 14:00 h. The UVI is reported for Europe on the internet at: www.ozone.fmi.fi/SUDAMA/

Exposure category	UVI range
Low	< 2
Moderate	3–5
Very high	6–7
Extreme	8–10

From Intersun [51]

Only two studies considered the impact of their programmes on prognosis. Graham-Brown et al. [42] found no marked difference in the prognosis of tumours subsequent to the programme. MacKie et al. [45] noted a decrease in the mortality rate due to melanoma among women after the training of general practitioners and an extensive media campaign within a mass screening programme in Scotland. An Italian study estimated that 22 lives had been saved between 1977 and 1985 (74 deaths expected and 52 observed) in the region of Trentino, after a screening programme that included an educational campaign on early diagnosis for doctors and the general public [41].

Missing information and research topics

The quality of most of these programmes for primary prevention of skin cancer was not evaluated (see chapter on Evaluating cancer prevention activities). Nevertheless, like other prevention models, these initiatives improved knowledge about the determining factors of skin cancer and attitudes to protection. The incidence of skin melanoma in areas where intensive programmes have been implemented (Australia, Scandinavia and the United Kingdom) is decreasing in the youngest cohorts, particularly among women (see figure 1). Incidence rates are, however, influenced by two contradictory phenomena: an increase due to early detection, and particularly screening, and a decrease due to primary prevention. We still need effective, long-lasting, comprehensive prevention campaigns that include not only adequate information and educational programmes but also training of health professionals and lobbying of the media and politicians. Such campaigns must include an evaluation protocol.

In neither the programmes to increase awareness about early symptoms nor in the screening campaigns was the cost of the interventions measured. The numbers of false-negative and false-positive results, which increase the numbers of consultations and biopsies, and the cost of over-diagnosis (detection of tumours that would not have become invasive, metastatic types) were not evaluated, although some attempts were made to measure financial costs [39,41].

In biological research, new tools are needed to identify high-risk individuals, by either phenotype or genotype. Better knowledge about the biological effects of various times and doses, the mechanisms of natural photoprotection and how such mechanisms can be modified are other important fields of research.

Conclusions and recommendations

The evidence summarized in this review indicates that a faster, more efficient impact could be obtained by improving awareness about early diagnosis. On the basis of the experience of Australia, the incidence of skin cancer could be reduced by comprehensive preventive interventions, directed at children and adolescents. Long-term strategies are required to change people's habits with regard to exposure to the sun and the current social view that associates a tan with good health. Cooperation of medical, governmental and non-governmental organizations is necessary to implement far-reaching educational strategies [52].

The actions that NGOs can promote are:

Awareness about early diagnosis

- educating individuals about skin self-examination (early symptoms);

Key recommendations

Too much sun is dangerous, no matter what your age or skin colour, but:

For high-risk skins:

1. Babies must never be exposed to UV radiation, and children must be well protected.
2. People with fair skins or reddish hair are particularly sensitive and must use adequate protection.
3. Sunscreens protect from sunburn but do not give adequate protection for a longer stay in the sun.
4. Some people cannot tan and only burn; they must accept that.

For those who tan:

5. Exposure should be adjusted to the solar radiation index values given by weather forecasters, and the zenith time (12:00 h to 16:00 h in Europe) should be avoided.
6. Being tanned does not provide complete protection.
7. The best sun protection is shade or clothes; clouds are not a good screen.

Essential knowledge:

8. The negative effects of UV radiation are cumulative during life.
9. The higher the altitude, the more the sun burns the skin, and reflection of UV radiation by sand, water or snow increases the intensity of exposure.
10. Artificial UV radiation is also dangerous, and its use should be carefully controlled.
11. Some drugs and perfumes can create secondary effects (e.g., allergy, burning) with exposure to UV radiation. A doctor should be consulted before such products are used and when exposure to UV radiation is expected.

UV radiation index, skin type and protection

UV index	Phenotype	Protection Sunglasses*	Hat	Tee-shirt	Umbrella	Sunscreen (SPF)
11+	I, II			No exposure at all		
	III	Yes	Yes	Yes	–	30
	IV, V	Yes	Yes	Yes	–	30
8–10	I, II	Yes	Yes	Yes	Yes	30
	III	Yes	Yes	Yes	–	30
	IV, V	Yes	Yes	–	–	15
3–7	I, II	Yes	Yes	Yes	–	30
	III	Yes	Yes	–	–	15
	IV, V	Yes	–	–	–	15
1–2	I, II	Yes	Yes	–	–	15
	III	Yes	–	–	–	15

*Containing UVB and UVA filters

- training in early diagnosis for general practitioners, nurses and all health professionals who examine people's skin;
- encouraging other professionals, such as hairdressers, aestheticians and physical activity teachers, to advise their clients or students to consult a doctor; and
- providing tools for the education and training of various target groups.

Reducing exposure to the sun

- Avoidance of the sun during childhood has a greater effect in reducing health risk than sun protection during adulthood.

NGOs could disseminate valid, adapted information to appropriate target groups, about:

- the risks of exposure to UV radiation;
- high-risk populations (e.g., children, people with sensitive skin),
- variations in the intensity of UV radiation, by geographical region, altitude, season, hour of the day and length of exposure; and
- protective means (e.g., parasols, hats, special clothes, sunscreens, sunglasses).

NGOs could facilitate education in schools by providing paedagogic tools.

NGOs could lobby for collective protection by demanding:

- shaded areas on school grounds, at work places, in public outdoor places (beaches, swimming pools, stadiums, racetracks);
- low prices for protective devices; and
- legislation to establish standards for apparatus used for artificial UV delivery, either for lighting or for tanning (sun lamps and sun-beds).

Funding

- Well-organized communication campaigns, including an evaluation protocol, for either primary prevention or early detection
- Scientific research projects on determinants of behaviour, mechanisms of UV carcinogenesis, role of genetic factors, role of melanin production.

Measures and desired outcomes in skin cancer prevention

Measure	Desired outcome
Training	
Creating education tools (guidelines, school programmes)	Increased individual knowledge and awareness about harmful skin lesions
Programmes for early diagnosis for health professionals (general practitioners, nurses)	Increase performance of professionals; decrease mortality
Information and communication	
Disseminating evidence-based information on health effects of UV; use of UV index, focussing on young people	Increase efficacy of prevention Modify attitudes and behaviour of young people
Evaluating the impact incidence rate	Decrease in skin cancer
Advocacy and lobbying	
Contacting media, politicians, decision-makers, industries	Provide shade in public places; legislation on prices of protective devices and solaria; protection of outdoor workers
Health professionals	Motivate for counselling and early diagnosis
Cosmetic and fashion industries	Validated advertisements for sunscreens, sunglasses, tanning aids
Funding	
Mass media campaigns	Modify behaviour; increase early diagnosis
Coordination of funding sources and policy development to create educational tools	Modify behaviour
Epidemiological monitoring	Affect incidence trends
Research	Increase knowledge about high-risk populations; mechanism of UV carcinogenesis; specific protective devices; treatment

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At least 15% of all new cases of cancer worldwide can be attributed to infections with viruses, bacteria or parasites. Over three-quarters of these cases occur in developing countries. The largest infection-related burden is due to primary liver cancer, stomach cancer and cervical cancer. Of these three, primary cancer of the liver is the one that can be most readily prevented, the incidence being drastically reduced by immunizing children against hepatitis B virus and by preventing the transmission of hepatitis C virus.

In Western countries, control of morbidity and mortality from cervical cancer is achieved by regular cytological screening, and alternative procedures for early detection, which are cheaper and more practical in developing countries, are being tested. Vaccines against the human papillomaviruses may herald a new era in which the whole strategy of prevention and early detection is changed.

Prevention of stomach cancers caused by Helicobacter pylori is different from that of the other two cancers, as the incidence can be modulated effectively by improving hygiene in childhood and dietary habits throughout life. AIDS-associated cancers can be avoided by preventing and treating infection with human immunodeficiency virus (HIV), even if this is only a co-factor that creates the conditions for induction of malignant transformation by Kaposi sarcom-associated herpesvirus.

Infections

Infections

F. Xavier Bosch[1], Silvia Franceschi[2], René Lambert[2], Josepa Ribes[1] and Paola Pisani[2]
[1] Institut Catala d'Oncologia, Barcelona, Spain
[2] International Agency for Research on Cancer, Lyon, France

Causal links have been established between certain infectious agents and cancers at defined sites. The evidence for the associations listed has been reviewed by international groups of experts as part of the International Agency for Research on Cancer (IARC) programme on the evaluation of carcinogenic risks to humans [1–5]. These causal links are therefore established, and the reader is referred to the extensive reviews for a thorough discussion. In this chapter, we focus on options for prevention. Estimates of the proportions of cancers attributable to chronic infections have been obtained for different areas of the world [6,7] and we used these to estimate cancer incidence and mortality in 2000. The resulting numbers are given in Table 1.

Relevant points from the European code

- Participate in vaccination programmes against hepatitis B virus infection. (point 11)
- Women from 25 years of age should participate in cervical screening. This should be within programmes with quality control procedures in compliance with European guidelines for quality assurance in cervical screening. (point 8).

Table 1

Infectious agents that cause cancers at specific sites

Cancer site	Annual incidence		Causative infectious agent	(%) Potential for eliminating infectious agent
	Advanced economies	Developing countries		
Liver, hepatocellular carcinoma	106 000	457 000	HBV, HCV	45, 85[a]
Stomach, carcinoma; non-Hodgkin lymphoma (MALT)	333 000	543 000	*H. pylori*	50
Cervix, vulva and other external genitalia	100 000	385 000	HPV 16, 18, 31, 33	100
Kaposi sarcoma in AIDS[b]	8 600	330 000	HIV–KSHV	100
Non-Hodgkin lymphoma in AIDS	2 200	33 000	HIV–EBV	100
Burkitt and other non-Hodgkin lymphoma & Hodgkin disease	264 000	558 000	EBV	0
Nasopharyngeal carcinoma, undifferentiated	5 000	41 000	EBV	0

MALT, mucosa-associated lymphoma tissue; HBV, hepatitis B virus; HCV, hepatitis C virus; *H. pylori*, Helicobacter pylori; HPV, human papillomavirus; HIV, human immunodeficiency virus; KSHV, Kaposi sarcoma-associated herpesvirus; EBV, Epstein-Barr virus

Source of incidence rates: Ferlay et al. [8]
a Potential in advanced and developing countries
b Source: UNAIDS [9]

The hepatitis viruses and cancer

Scientific evidence for disease etiology

Strong evidence that chronic infection with the hepatitis B virus (HBV) induces hepatocellular carcinoma was already available in the 1970s [1]. About 5% of the populations of Eastern and Central Europe are chronically infected, while the prevalence is less than 1% in Northern Europe [10]. After the identification of the hepatitis C virus (HCV) in 1989, evidence rapidly accumulated that this virus also is responsible for a substantial proportion of new cases of liver cancer. HCV infection is less common than chronic HBV infection, but has a greater propensity to induce chronic infection and therefore liver cirrhosis and cancer. Persistent infection develops in 80% of newly infected patients. With rare exceptions, less than 2% of the population of Europe are carriers of persistent infection [11]. Worldwide, 75–80% of cases of liver cancer are related to persistent hepatitis virus infection. In Europe, HBV is associated with 4–58% of cases and HCV with 12–72%.

In Europe, acquisition of HBV or HCV at birth is rare, and most infections are acquired in adulthood, through sexual contacts, intravenous drug use, transfusion of blood products or other invasive procedures under non-sterile conditions [12].

Methods and characteristics of effective intervention

A safe prophylactic vaccine of proven efficacy against HBV has been available since the late 1980s. It is the first and currently the only vaccine against a human cancer, and vaccination is the most effective means for preventing transmission of HBV. When administered properly, the vaccine induces protection in 95% of recipients. Evidence that mass immunization is followed by a decrease in the incidence of liver cancer has been reported in Taiwan [13] and the Republic of Korea [14]. The World Health Organization (WHO) and the World Bank have concluded that vaccination against HBV is one of the most cost-effective interventions for reducing morbidity, and, by 1996, about 80 countries had included vaccination against HBV in their national immunization programme [15, 16]. The relatively slow introduction of the HBV vaccine is clearly due to its cost, as can be seen from the economic profiles of countries that are ahead in planning and achieving high coverage rates.

Increasing coverage, and decreasing HBV-related mortality will therefore require additional efforts for delivering heat-stable vaccines, creative financing and possibly the use of multivalent vaccines [17].

There is no prophylactic vaccine against HCV. Research is under way, but the ability of this virus to mutate makes progress slow. Prevention at present relies on avoiding transmission of the infection by blood contacts. It should therefore be concentrated on all practices in health-care settings, such as medical and dental interventions, and should include safety of blood products, providing disposable needles and syringes to intravenous drug addicts and increasing the awareness of adolescents and young adults of the need to take precautions during sexual intercourse [18].

Associations with other risk factors increase the risks for liver cancer related to HBV and HCV infection. These factors include eating foods contaminated with aflatoxins and alcohol consumption. Control of contamination of foodstuffs with aflatoxins could reduce the risk for liver cancer associated with HBV infection, and a reduction in the consumption of alcoholic beverages could reduce the risks associated with HCV infection.

The papillomaviruses and cancer

Scientific evidence for disease etiology

Around 2000, invasive cancer of the cervix, the second most frequent cancer in women, accounted for 4% of all new cases of cancer in affluent countries and for 15% in developing countries [19].

Current knowledge indicates that all cancers of the cervix are caused by some type of human papillomavirus (HPV) [20]. About 40 distinct types of HPV are known to infect the genital tract, and at least 12 of these are associated with progression to invasive cervical cancer; these are known as 'oncogenic' or 'high-risk' types. Intense research over the past 10 years has resulted in identification of the most carcinogenic types [3], which are responsible for 60–80% of invasive cervical cancers. The mechanisms of persistent infection have also been found [21]. The potential for primary prevention is therefore very high.

Many types of HPV are associated with benign cervical dysplasia, complicating the development of wide-spectrum prophylactic vaccines. Nevertheless, promising results were announced recently [22]. In a phase III trial, an HPV16 vaccine was 100% successful in preventing persistent infections and premalignant lesions. Two other candidate vaccines against both HPV16 and HPV18 are being tested in phase III clinical trials.

Preventing cancer related to HBV and HCV infection

- Immunize children against HBV
- Increase the safety of blood products, plasma derivatives, organs, tissue and semen by screening these products for the HBV and HCV.
- Improve sterilization of medical, surgical and dental equipment.
- Establish educational programmes for practitioners of non-traditional and folk medicine (acupuncture and circumcision), for persons who perform tattooing, body piercing and scarification and for the people who use these services.
- Minimize occupational exposure by educating health-care professionals about accidental exposure to blood and blood products.
- Establish educational programmes and programmes for exchange of syringes and other injection equipment for intravenous drug users.
- Counsel adolescents and young adults about high-risk sexual practices and illegal drug injection.
- Screen pregnant women for HCV/HBV.
- Provide counselling and education about alcohol consumption.
- Control contamination of foodstuffs with aflatoxins.

Methods and characteristics of effective intervention

HPV infection is very common: at any one time, 5–40% of adult women and men are HPV carriers. Except for genital warts (caused chiefly by the low-risk types 6 and 11), the infection is symptomless. There is no clear evidence that barrier methods of contraception, most notably condoms, protect against HPV infection [23]. The apparent failure of condom use to prevent HPV infection may be due to anatomical reasons (i.e. HPV infection in genital areas not protected by the condom) and behaviour. Circumcision was found to be associated with a decreased risk for penile infection with HPV and cervical cancer [24].

An alternative strategy for preventing cervical cancer might be to intervene against factors known to facilitate the persistence of HPV infection or the progression of an infection to neoplastic cervical lesions. These factors include immune suppression [3], having more than one child [25], long-term use of oral contraceptives [26], cigarette smoking [27] and some other sexually transmitted diseases (infection with herpes simplex virus-2 or Chlamydia trachomatis) [28,29].

Nevertheless, vaccines against HPV offer by far the best hope for controlling HPV infection. A prophylactic vaccine would have to be administered to a woman before she has become infected. Ideally, the vaccine should be given to children; however, the present trials are being conducted with young women to allow monitoring of the efficacy of the vaccine within a reasonable time (approximately 5 years).

Missing information and research topics

Many challenges remain in the development of an effective, efficient prophylactic vaccine against cervical cancer.

- It is not clear which elements of the human immune system are important in preventing or resolving HPV infections.
- If the phase III clinical trials provide scientific evidence for the efficacy of a vaccine against viral infection, this may lead to over-treatment of transient, harmless HPV infections.
- Demonstration of the effectiveness of an HPV vaccine in preventing cervical cancer in a high-risk population will take many years. Consequently, such trials should be started as quickly as possible; however, such studies are expensive and would probably not be funded for developing countries by the pharmaceutical industry.
- While safety and efficacy are essential, ways of reducing costs and thus increasing vaccine coverage must be considered. These will include formulating a stable oral vaccine that does not require an expensive cold-chain and can be produced in developing countries.

The value of HPV testing combined with cytology is being assessed in parallel with these lines of research [30,31], with the aim of improving the accuracy and cost-effectiveness of screening. HPV testing has, however, still not been found to be a suitable replacement for cytology in cervical screening (see chapter on Screening).

In developed countries, high-quality programmes of screening by cytology and treatment of pre-invasive lesions have successfully decreased the incidence of and mortality from the disease. Such programmes are too expensive for most high-risk areas, and alternative screening procedures based on simpler techniques are being tested in various settings [32]. The results are expected in the near future. Mass screening requires extensive human resources and materials as well as access to diagnosis and treatment for everyone with positive results (see chapter on Screening). Restricted access to timely, effective treatment in countries with few resources will jeopardize screening, and the relatively poor efficacy of these processes might be limited and ultimately not cost-effective [33].

In conclusion, primary prevention of cervical cancer could be achieved in the future by mass immunization campaigns with HPV vaccine. At present, the most effective means is the detection and treatment of precancerous lesions. Screening programmes adapted to high-risk populations must be evaluated and promoted.

Helicobacter pylori and cancer

Helicobacter pylori has been postulated to play a role in cancers at various sites in the gastrointestinal tract, but only a

role in cancer of the stomach is seriously considered. The incidence of gastric carcinoma has been decreasing at an annual rate of 5% over the past 25 years in both men and women in Europe, except in Greece, Italy, Portugal and most eastern European countries, where the decrease has been smaller and more recent. Primary non-Hodgkin lymphoma of the stomach accounts for about 5% of gastric tumours. The role of *H. pylori* in the progression of gastric lymphoma is now accepted.

Scientific evidence for disease etiology

The bacterium *H. pylori* which colonizes the human stomach, was first isolated in 1982. The infection is ubiquitous and used to be common worldwide [2]. In most cases, it is acquired early in life through oral contamination and persists with no or mild symptoms. Its transmission is favoured by overcrowding and low economic status. The common gastric disorders that develop in infected persons include chronic gastritis, duodenal ulcer and, in a small number of individuals, gastric cancer or B-cell mucosa-associated lymphoid tissue lymphoma, known as 'MALT'. The bacterium is classified as a human carcinogen [2].

In contrast to the viruses described above, *H. pylori* is only weakly associated with neoplastic disease: few infected individuals develop gastric cancer or duodenal ulcer. It is now clear that it is only a contributing factor to the mechanism leading to malignancy. The relevant co-factors are susceptibility of the host and habitually eating a diet with a high salt and nitrate content, which enhances progression of alterations in the gastric mucosa and the formation of carcinogens (nitrosamines) in situ. In contrast, a high intake of fruits and vegetables is associated with a reduced risk for gastric cancer [34].

Also being investigated is the possibility that some strains of the bacterium are more efficient than others in inducing atrophy, which is essential to the development of gastric cancer. The virulent strains that have been strongly associated with peptic ulcer and cancer are those carrying genetic variants [35–38]. The hypothesis that only some genetic variants of the bacterium are relevant to malignant transformation would explain the inconsistent geographical patterns of association between the prevalence of infection and the incidence of gastric cancer [39,40]. A global correlation between the declining of incidence of stomach cancer and the declining prevalence of *H. pylori* infection has been suggested by various studies [41,42].

Methods and characteristics of effective intervention

Two types of intervention could be envisaged to eradicate the infection: screening for *H. pylori* and treatment with antibiotics or vaccination. The first option appears the least feasible, because it would require treatment of a large proportion of the population at all ages. A simulated analysis in Australia concluded that such a programme (screening and treatment) would probably result in less than what would be achieved naturally with an unplanned decline in incidence over 15 years.

Restricting eradication of the infection to elderly people, to make the intervention more cost-effective, has been questioned on the basis that, by that age, most of the damage that eventually leads to malignancy had already been done, in the form of atrophy of glandular cells. As such damage is irreversible, intervening at that stage is unlikely to have a significant effect on the incidence of gastric cancer [43]. Vaccines that are effective in experimental animal models have been developed, but none of those tested in humans is yet available.

In considering interventions to eradicate *H. pylori* infection, it should be remembered that the bacterium has colonized the human stomach for at least 100,000 years and has evolved together with the human species. If only some genetic variants of the bacterium are pathogenic, human host characteristics might be critical for pathological evolution of the infection [36]. Elucidation of these aspects might lead to the identification of small subgroups of susceptible individuals who harbour the virulent genetic types, who would benefit from antibiotic treatment.

Chemoprevention of stomach cancer has been proposed by the addition of β-carotene, retinol, a-tocopherol and vitamin C. In two studies conducted in Europe, neither α-tocopherol nor β-carotene had any effect on the occurrence of gastric neoplasms [44]. Nevertheless, the prevalence of gastric carcinoma has been declining steadily in high-risk populations for several decades [45]. Improved diets-more fruit, less salt and better food conservation, particularly for children-have resulted in a delay and an overall decline in the rate of infection, which has certainly contributed to the decreased incidence of gastric cancer.

In conclusion, an active programme of prevention would be justified only in countries where the risk for stomach cancer is still high. Priority should be given to improving food conservation, in industrialized structures (cold chain, salt) and in private homes (refrigerators). Information and education on a balanced diet and hygienic practices in preparing food could complete a comprehensive programme. The low incidence of MALT does not justify a large-scale planned prevention programme, as early detection can lead to successful treatment by bacterial eradication.

AIDS and cancer

Scientific evidence for disease etiology

Cancer is an important complication of AIDS. The recognition of a significant increase in the incidences of Kaposi sarcoma and non-Hodgkin lymphoma in the USA was a major step towards recognition of the AIDS epidemic before the causative agent had been identified. Kaposi sarcoma is a defining condition in the diagnosis of AIDS in persons infected with the human immunodeficiency virus (HIV), whose risk for developing this malignancy is 100 times greater than that of the general population [46]. Immune suppression by HIV-1 is the factor that enhances herpes virus 8, now called Kaposi sarcoma-associated herpes virus, which is the causative agent of all AIDS-related and classical or sporadic Kaposi sarcoma.

The second most common type of cancer in HIV-infected individuals is non-Hodgkin lymphoma, and particularly the extra-nodal form. These tumours tend to develop in advanced AIDS and are a common cause of death of AIDS patients. Other tumours that occur commonly in AIDS patients are Hodgkin disease, invasive cervical cancer and ano-rectal and liver cancers. Causative viral infections other than HIV have been identified for all of them, although none is sufficient to induce cancer in the target tissue.

Immunosuppression appears to be the co-factor that enhances their action.

Methods and characteristics of effective intervention

Primary prevention is based on the prevention of HIV infection, by ensuring the safety of blood products and plasma derivatives, sterilizing medical, surgical and dental equipment, educational programmes to prevent initiation of drug injecting or high-risk sexual practices and providing injection equipment exchange programmes for drug users.

Prevention is also linked to the treatment of AIDS. In affluent countries, the incidences of both Kaposi sarcoma and non-Hodgkin lymphoma in HIV-infected individuals dropped dramatically when antiretroviral therapy became widely available [47,48].

Epstein-Barr virus and cancer

Scientific evidence for disease etiology

Cases of Burkitt lymphoma occurring in Africa, a small proportion of these cases occurring elsewhere and about 70% of cases of Hodgkin disease in children are associated with infection with the Epstein-Barr virus (EBV) [7].

Immunosuppression is an important component of the activation of EBV, since an excess risk for non-Hodgkin lymphoma is also seen in persons who have received transplants. EBV infection is ubiquitous and, in most infected individuals, occurs during childhood. In the large majority of the population, the infection is persistent but latent and may never give any clinical signs. EBV is also an important cause of undifferentiated nasopharyngeal cancer among particular ethnic groups, such as Chinese and Inuit people, but also in some communities in Northern Africa [5]. For these cases, a relevant co-factor is a genetic predisposition, allowing the virus, which normally infects B lymphocytes, to infect epithelial cells. Another co-factor for nasopharyngeal tumours is the presence of precursors of carcinogenic nitrosamines in the diet during childhood, due either to salting for conservation (in China) or long cooking (North Africa) [49].

Under particular conditions, therefore, such as immunosuppression, genetic predisposition or a specific diet in infancy, EBV may lead to malignant transformation. Nevertheless, this is a rare complication of the infection. Poor understanding of the balance between persistent infection and immune response complicates the development of vaccines against EBV.

Methods and characteristics of effective intervention

Neither changes in diet or reducing immunosuppression have been shown to be an effective means of primary prevention. It has been observed, however, that migrants from countries with a high risk to one with a low risk show a clear decrease in the incidence of such tumours; in the second generation, the risk is as low as that in the adopted country. Similarly, young people from a low-risk country who move to a high-risk country increase their risk. No vaccine against EBV has been tested in humans.

Conclusions and recommendations

- Spread validated information about the links between infections and cancer.
- Promote programmes to immunize children against HBV.
- Support research on the development of other vaccines, particularly against HPV.
- Advocate safe blood products, plasma derivatives, organs, tissue and semen through viral screening of these products.
- Lobby for standards in sterilization of medical, surgical and dental equipment.
- Provide information about the risks of acupuncture and circumcision and those associated with tattooing, body piercing and scarification and advocate for legislation and controls.
- Provide information about occupational exposure to infection from injection of contaminated blood products by educating health-care professionals.
- Lobby for programmes for the exchange of syringes and other injection equipment for intravenous drug users.
- Organize counselling for adolescents and young adults about high-risk sexual practices and illegal drug injection.
- Organise counselling and education about alcohol consumption and healthy diets.
- Advocate control of food contamination and composition.
- Promote prevention and treatment of HIV infection.
- Promote healthy diets. (see chapter on Diet)

Other infection-related cancers

- The human T-cell lymphotropic viruses (type I and possibly type II) cause a rare type of haematopoietic malignancy, adult T-cell leukaemia/lymphoma, which occurs only in areas where this viral infection is highly prevalent. Perinatal and sexual hygiene and safe medical practices avoid transmission of the virus, and these are the only options for prevention.

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Screening

Any public health intervention, and particularly those that imply a medical action (screening test, preventive treatment), must be evaluated carefully for advantages and drawbacks before it is implemented in a population. The ethical imperative for all medical interventions is to ensure that any potential benefits will outweigh the harm. This is particularly true for screening, because the participants are healthy people Thus, a programme should, at the very least, allow demonstration of an overall benefit to the community and a minimal risk that some individuals might be disadvantaged by the programme. As screening is initiated by a health system, the individuals invited to participate must be informed, before any testing, about both potential adverse effects and potential benefits. They must also be ensured of optimal quality of care, which only an organized programme can provide, while at the same time respecting their rights and freedom.

There is a large body of evidence on the effectiveness of screening for cancers of the breast, cervix, and colo-rectum. There is still no evidence that population-based screening for cancers of the prostate or head and neck or for skin melanoma reduces the mortality rates from cancers at those sites.

Screening

Nereo Segnan[1], Paola Armaroli[1] and Hélène Sancho-Garnier[2]
[1] Centre for Oncological Prevention, Turin, Italy
[2] Epidaure, Department of Epidemiology Prevention, Regional Cancer Centre, Montpellier, France

This chapter reviews the principles and the conditions that must be satisfied in implementing a cancer screening programme, and the cancer sites that could be affected by such programmes.

Principles

The aim of cancer screening is to reduce mortality from the disease and, if possible, also the incidence, by identifying individuals with pre-symptomatic lesions who may require further examination and treatment. The appropriate treatment at the time of detection must result in a higher cure rate.

The ethical imperative in screening is to ensure that the potential benefits outweigh the harm. Strict organization is necessary to ensure that the available resources can permit delivery of an equitable, high-quality programme to the entire population, rather than a programme of uncertain quality that is accessible to only certain classes of society.

The role of NGOs is to ensure quality and equity at each step of a screening programme.

Implementing a screening programme

The classic conceptual framework for implementing a screening programme was proposed by Wilson and Jungner [1] for the World Health Organization (WHO), as summarized in the box below.

The effectiveness of a screening procedure may differ in different populations. Therefore, programmes should be tailored to local conditions in the framework of the available scientific evidence and recommendations. According to the WHO principles and updated recommendations [2–4], the aspects that should be investigated before a screening programme is implemented are:

- the relative burden of the cancer in the population,
- the natural history of the disease,

The classic conceptual framework for implementing a screening programme

1. The condition should be an important health problem.
2. There should be an accepted treatment for patients with recognized disease.
3. Facilities for diagnosis and treatment should be available.
4. There should be a recognizable latent or early symptomatic stage.
5. There should be a suitable test or examination.
6. The test should be acceptable to the population.
7. The natural history of the condition, including development from latent to declared disease, should be adequately understood.
8. There should be an agreed policy on whom to treat as patients.
9. The cost of case-finding (including diagnosis and treatment of patients in whom disease is diagnosed) should be economically balanced in relation to possible expenditure on medical care as a whole.
10. Case finding should be a continuing process and not a 'one off' project.

- the quality of the screening test,
- scientific evidence of the efficacy and effectiveness of the screening test,
- the balance between advantages and drawbacks of the screening test, and
- the cost–benefit of screening.

The relative burden of the cancer in the population

Incidence, survival and mortality related to cancers at specific sites differ from one country to another (see chapter on Europe's cancer burden), and these indicators determine a country's priorities. For example, if the stage-specific survival rate from a cancer at specific stages of development is lower in the target population than in other populations with the same demographic characteristics, the treatment should be improved before screening is introduced. If the stage-specific survival rate is comparable but the overall survival is lower, an attempt should be made to reduce the number of cancers already at a late stage before introducing screening. Such interventions are likely to be more cost-effective than screening.

The natural history of the disease

The cancer has to have a long enough stage of pre-malignant or limited invasion to allow detection before incurable disease occurs. Moreover, as not all detected lesions become lethal disease, screening could lead to over-treatment. This adverse effect must be rare and limited to harmless, acceptable treatments. Examples of cancers in this category are squamous intra-epithelial lesions of the uterine cervix and colo-rectal adenomas.

The quality of the screening test

Because the test will be performed on millions of healthy individuals with a lifetime risk of disease ranging from less than 1% (invasive cancer of the cervix uteri) to more than 10% (breast cancer), it should be workable, acceptable, sensitive, specific and safe. Its cost should be bearable by the country's health system.

A test with poor sensitivity will miss cases and will result in a large number of false-negative results, thus decreasing the number of beneficiaries or even leading to delay in diagnosis and treatment. A test with poor specificity will result in a high rate of false-positive results, such that healthy persons undergo additional tests to rule out the presence of cancer. If the test is too complicated to perform or not easily accepted by the population, the participation rate will be low, and the effectiveness of the programme will be limited.

Quality control is mandatory and must include training of professionals, testing of equipment and evaluation of readers, as well as standards for procedures and reporting of results, time and mode of returning information to screened persons and physicians, an upper limit for the rate of positive results and archives of results, depending on the type of tests (radiology, cytology, biology).

Scientific evidence of the efficacy and effectiveness of the screening test

Real benefit is acquired only if death from the targeted cancer is eliminated or postponed. The added value of the screening test must be demonstrated in scientific studies. Study designs fall into a hierarchy of persuasiveness (see box), in which controlled randomized trials are the first.

When a screening programme is implemented, consideration must be given to the fact that the quantitative results obtained in such trials, for example 'a 30% reduction in mortality from breast cancer', cannot be expected to be reproducible on a routine basis; the observed benefit will be lower [6]. The size of the benefit depends on the participation of the target population, the quality of the programme and 'opportunistic' screening activities (screening outside of an organized programme). If high-risk individuals do not attend for screening, the benefit at the population level could be low. Of course, a reduction in mortality is achievable only if previous assessments for people who screen positive and treatment are available and used. If people with positive tests are not rapidly investigated to verify the presence of lesions, the delay obviates the potential benefit of the programme. Rapidly growing tumours with a poor prognosis are less likely to be detected at an early stage, and shorter intervals would not

Hierarchy of effectiveness of study design

- individually randomized controlled trials
- block randomized controlled trials
- cohort studies
- case–control studies
- cross-sectional comparisons
- historical (before and after) comparisons

Source: Blanks et al [5]

allow detection of all cases.
Screening also increases the perception of risk in the population, so that symptomatic cancers are identified at earlier stages. In this way, screening changes the diagnosis and treatment of the cancer. Detection of lesions of borderline malignancy and early lesions favours the development of more accurate diagnostic tools, such as stereotaxic guidance for small lesions of the breast, endoscopic removal of polyps of the colon and rectum and quality control in radiology, pathology and cytology. Early detection also leads to less invasive therapy. Quality assurance programmes should involve all the service providers participating in screening.

The balance between advantages and drawbacks of the screening test

The efficacy of cancer screening in reducing mortality from or incidence of the cancer is a necessary but not a sufficient condition for implementing a screening programme. No screening is without harm. "For every person found to have disease through screening, many more people are exposed to potential harms. If the number of persons for a screening test is 5000, those who advocate screening must make the ethical argument that the large benefits to one individual justify the sum of the harms to which 4999 people are exposed. Whether this holds up to moral scrutiny depends on the nature of the harm." [6].

The balance between expected benefit and potential harm must be carefully evaluated. The types and rates of adverse effects occurring in treated people can completely modify the acceptability of a screening programme. False-negative results may give a false sense of security and lead to legal action by people whose cancer appears to have been missed. False-positive results lead to additional examinations to rule out the presence of cancer. Follow-up testing might be uncomfortable, expensive and in some cases potentially harmful. Psychological consequences, such as anxiety, are likely to follow, as well as loss of trust in medical science. The physical or psychological risk of adverse effects should be very small and estimated continuously. Evaluation of health benefits should be based on the following outcomes:

- reduction in mortality or incidence,
- life years saved,
- conservative treatment,
- quality of life,
- disability-adjusted life years and
- reassurance for true-negative cases.

The evaluation of harm should be based on the following parameters:

- prolongation of disease,
- false-positive results,
- false-negative results,
- over-treatment for borderline or indolent lesions and
- anxiety and other psychological effects.

Potential participants should be informed about the advantages and disadvantages of screening in an honest, balanced way, and an informed decision to participate should be encouraged. Individuals should participate in screening on the basis of a real understanding of the harms and benefits. The participation should be voluntary, with the possibility of opting out at any time.

The cost–benefit of screening

The cost of screening should be balanced in relation to expenditure on medical care as a whole, including the time spent on diagnosis and treatment [7]. If diagnostic examinations and treatment cannot be offered to individuals with positive results, because of technical or economic problems, the goals of screening are invalidated and its reputation in the population is damaged.

Implementation of a screening programme is totally dependent on the availability of permanent funding. The budget should include costs for tests, diagnosis and treatment as well as for organization, communication, training, data collection, quality assurance and evaluation. The cost of cancer screening can be as high as the average annual health care cost per inhabitant or even higher, especially in developing countries. Resources for health care are limited, and cancer screening competes with other interventions, which, if more cost-effective, should be considered a priority (e.g., primary prevention of lung cancer). The costs of medical procedures can vary widely in different countries. Measurement of health benefits in terms of years of life saved does not capture the beneficial effects of screening on morbidity or quality of life. An alternative, although controversial, approach is use of cost–utility ratios, for example the cost per quality-adjusted life year (QALY) or disability-adjusted life year (DALY). Standards for good cost-effectiveness analyses have been developed [7], but few studies are available because the opportunities for estimating 'real' cost are generally poor.

Screening can be recommended on a population basis only if :

- it leads to the avoidance of a good proportion of new cancer cases by the detection and cure of pre-malignant lesions; its efficacy is measured by a decrease in the incidence rate of the specific cancer; or
- it results in a decrease in the mortality rate from the cancer being screened, owing to better cure of the disease in detected cases; and
- adverse effects are kept to a minimum, the advantages and disadvantages being well balanced, taking into account medical, social and economic costs.

The effectiveness of a screening procedure may differ from one country to another. Therefore, programmes should be tailored to local conditions, and coherent policies should be explicitly adopted. The incidence of cancer and the age structure differ among countries, as do public health priorities and health systems and the availability of tests and medical care. The size of the target population, the means necessary to offer adequate coverage, the inferred costs and the expected benefits and risks are arguments that should be considered in making a decision to screen. The final decision will depend on the cost–benefit ratio in relation to other competing health care needs.

Organizing a screening programme

When the occurrence of the cancer, survival, the expected reduction in incidence or mortality, the balance of advantages and disadvantages, the interaction between screening and health care system, and the cost and availability of resources have been assessed and look favourable, a decision can be made. If the decision is positive, the planning and organizing phase can begin. The requirements for implementing an effective screening programme are:

- The organization must ensure that benefits are optimized and drawbacks minimized.
- The practical arrangements for mass screening should aim at the same level of effectiveness as that obtained in demonstration studies. Before screening a large population, a pilot

study should be conducted to test the various components of the organization within the local health care system.

European and national guidelines and quality assurance plans

Guidelines are available specifying standardized procedures for the performance and interpretation of a screening test, assessment of positive cases, treatment when necessary, quality assurance procedures and the monitoring of data required to evaluate outcomes [8].

A quality assurance plan will ensure that the programme is followed under optimal conditions and will make it possible to remedy any observed inadequacies. All professionals should participate in the quality assurance system. There should be a commitment to modify screening standards, guidelines and best practices on the basis of new scientific evidence, permitting continuous upgrading of on-going programmes.

Adequate resources for starting and continuing the programme

The screening programme must be tailored to the country's health system. Cancer screening is part of a process, which includes screening, analysis of the results of the screening test, diagnosis and treatment. Close liaison must be maintained between the screening organization and the curative system, so that people with positive results can be cared for without delay and that the same measures, of the highest possible quality, are used throughout the territory covered by the programme.

The screening test may require the involvement of a primary care provider or specialized screening facilities. It is critically important that the screening test be readily accessible to the target population (close, quick, free). The health system must be able to provide timely, accurate responses to the results of the screening tests and a service for potential emotional effects. The provision of accurate, timely diagnoses is particularly important for screening tests with relatively poor specificity, because most people who have positive results will not have the cancer. Timely assessment is essential to minimize their anxiety. Screening alone does not reduce mortality or morbidity, and there must be access to high-quality assessment and treatment. Moreover, currently accepted population cancer screening strategies require repeated testing at regular intervals in order to have a substantial effect on mortality rates. Population cancer screening should be regarded as a continuous process requiring regular recalls of eligible people.

To be efficient, an organization needs effective coordination among partners and adequate funding for human and technical assistance.

Training of all personnel involved in the programme

Lesions detected at screening are usually different from symptomatic lesions, and the personnel involved in diagnosis require specific training. Training for communication of benefits and risks, psychological support and the screening process should be provided to all professionals involved.

Invitation system for the target population

If an organized programme does not involve sending invitations, a large proportion of the eligible population may be inadequately covered and the interval between tests for screened subjects may be inadequate. In addition, people who are not adequately screened tend to belong to lower social classes, resulting in inequalities in access (see chapter on Social inequalities in cancer). Active invitation should therefore be introduced to increase coverage, improve cost-effectiveness and reduce inequalities.

Main steps in implementing a national screening programme

1. Determine whether such a programme is a public health priority.
2. Determine whether the human and financial resources exist.
3. Describe the organization in an adequate protocol.
4. Conduct a pilot programme to test the protocol.
5. Design quality assurance and monitoring systems for evaluating the effects, costs and quality indicators.
6. Solve problems of financing, organization and evaluation.
7. Disseminate the programme to the entire target population, when successful.

A communication strategy should be devised to reach the target population and all professionals involved in the programme. Advertising through the mass media could be planned, preferably at regular intervals, to reinforce the message. Newspapers, magazines, television and radio can disseminate information promoting screening. Sponsors should be approached for advertising or support of NGO activities. These strategies are not mutually exclusive and should be tailored to the local situation. The information about the advantages and drawbacks of screening given to individuals should be honest and balanced, and an informed decision to participate in screening should be encouraged.

A monitoring system for evaluation of outcomes

A monitoring system for evaluating the impact of a programme should allow for identifying sources of failure, such as insufficient coverage, high recall rate, low specificity or low sensitivity of the screening process and loss to follow-up after a positive result. The data needed for monitoring and evaluating a programme are:

- lists of invited (target) and participating populations;
- participation rate;
- recall rate (after a positive test);
- cancer detection rate;
- stages of the detected cancers;
- rate of interval cancers;
- reductions in mortality and incidence;
- life years saved;
- per cent conservative treatment;
- quality of life; and
- disability-adjusted life years.

Side-effects and costs should also be reported, including those for;

- prolongation of disease,
- false-positive cases,
- false-negative cases,
- over-treatment for borderline or indolent lesions, and
- anxiety and other psychological effects.

Screening for which cancers?

The effectiveness of screening for cancers of the breast, cervix and colo-rectum is well-documented, but there is no evidence that population-based screening for cancers of the prostate or head and neck or skin melanoma reduces the number of deaths from cancers at these sites. Although there is currently no evidence that screening for lung cancer is effective, primary prevention can reduce the incidence by 90%! The recommendations of the European Union [3,4] for screening are summarized below.

Breast cancer

Each year, breast cancer is diagnosed in about 210,000 European women and kills around 74 000 [9]. There is no clear possibility of primary prevention.

Despite recent controversy about the quality of the trials, it has been concluded that there is sufficient evidence [10] that screening women aged 50–69 years by mammography every 2 years is the sole well-established means of reducing mortality from breast cancer. Screening should be done within programmes that have quality control procedures, according to European Union guidelines [8]. There is limited evidence for the

efficacy of mammographic screening women aged 40–49 years (without familial risk) in reducing mortality from breast cancer. Early meta-analyses failed to demonstrate a statistically significant reduction in mortality. More recent meta-analyses with longer follow-up suggest, however, a 15% reduction in mortality after 10 years, probably due to ageing of the cohort [11]. The efficacy of screening older women (69–74 years) is supported by the results of a trial in two counties in Sweden, where a significant, 32% reduction in mortality was observed. Screening until the age of 74 is proposed in some countries, particularly when the life expectancy is greater than 80 years, as in France.

Estimates of the cost of breast cancer screening range widely, depending on many parameters, including the health system, economic and demographic data and modalities of screening [12–14]. Each country must estimate its own cost-effectiveness *a priori* in choosing whether to implement a screening programme.

Cervical cancer

An organized screening programme with Papanicolaou (Pap) smears can reduce both the incidence of and mortality from cervical cancer [15].

During the past 30–40 years, the incidence of cervical cancer has decreased in Europe [16], and the decrease in incidence has led to a 30–60% decrease in mortality. In 1998, about 22,600 cases were diagnosed in European women, and 10,100 deaths were observed [9].

The European Union recommends that, when screening is offered, women should start to use it at the latest by the age of 30 but definitively not before the age of 20 [3]. The screening should be done within a programme with quality assurance, according to the European Union Guidelines for Quality Assurance in cervical cancer. The upper age limit should depend on the available resources but should preferably not be under 60 years. Limited screening resources should be concentrated in the age range 30–60 years.

In a recent analysis, the sensitivity and specificity of Pap smears were calculated to be about 51% and 98%, respectively [17]. False-negative results are due to errors of both sampling and interpretation (one-third of false-negative results), demonstrating the importance of quality control. The screening interval should be 3–5 years. Screening more often than every third year should be discouraged [18].

New techniques (thin-layer cytology, computerized re-screening, testing for human papillomavirus) are not recommended for primary screening, as they are relatively expensive and their incremental impact on health outcomes has not yet been clearly demonstrated [19].

Colon and rectal cancers

Each year, colo-rectal cancer is diagnosed in about 220,000 Europeans and kills around 112,000 [9]. No efficient means of primary prevention have yet been identified.

There is sufficient evidence to recommend implementation of well-organized mass screening for colo-rectal cancer by faecal occult blood testing at least every 2 years in asymptomatic people over 50 years of age and without familial risk [20,21]. The test should be repeated every 2 years to achieve better programme sensitivity, as the sensitivity of a single faecal occult blood test is low. Re-hydration increases sensitivity but decreases specificity, leading to more useless colonoscopy; consequently, it is not recommended. Recent studies have also shown an association between screening for colo-rectal cancer and a decreased incidence of the disease [22], lending support to the hypothesis that the removal of polyps identified at screening prevents colo-rectal cancer.

The magnitude and the duration of the protection provided by flexible sigmoidoscopy screening is under investigation [23,24]. Flexible sigmoidoscopy has been shown to be a safe, acceptable screening test. At present, scarce information is available about the impact, cost and side-effects of colonoscopy used for screening.

Missing information and research topics

Population-based screening throughout the European Union for cancers at sites other than those described above will not be recommended until health benefits have been shown. The screening tests currently being tested are prostate-specific antigen for prostate cancer; immunological faecal occult blood testing, flexible sigmoidoscopy and colonoscopy for colo-rectal cancer; and visual inspection with acetic acid, liquid-based cytology and testing for human papillomavirus for cervical cancer and CAT (Computerised Action Tomography for lung cancer). No other cancer is currently a good candidate for screening.

Conclusions and recommendations

NGOs can act in four areas:

- Lobby governments:
  - to implement population-based screening programmes for breast cancer, cervical cancer and colo-rectal cancer;
  - to ask for quality assurance (accreditation and audit), adequate institutional resources and evaluation; and
  - to improve existing screening programmes.
- Raise public awareness and thus the participation rate:
  - by giving the media access to information on risks and benefits,
  - by advocacy, web sites, fact sheets and information campaigns.
- Train professionals to conduct quality assurance and evaluation of impact (regional and national):
  - by organizing training sessions on testing procedures, interpretation, data collection and statistical analysis.
- Support research to design more efficient strategies, new tests and screening for cancers at other sites and for low-income countries.

Measure	Desired outcome
Legislation and policy	
Implement organized, proven screening	Reduce incidence and mortality
Provide staff and adequate resources	More efficient organization
Ensure quality assurance: accreditation, guidelines, audit, evaluation	Improve security, results, accessibility, quality and effectiveness
Information and communication	
Advocacy and information campaigns	Raise professional and public awareness, increase participation
Provide information (e.g., leaflets, websites)	Empower individuals
Training	
Train health professionals and all others involved	Ensure equity and quality
Research	
Investigate behaviour and costs Develop new screening tests, innovative approaches	Improve effectiveness: benefit–cost ratio

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Recommendations for action

Recommendations for action

Andreas Biedermann
Oncosuisse and
Swiss Cancer League
Switzerland

Capacity, data and methods

The main objective of cancer organizations is to fight cancer. They are therefore a key force in encouraging governments to develop comprehensive cancer control programmes. A primary task is to bring together important stakeholders in governments and the private sector to form a broad alliance. The aim of this alliance should be to design programmes on the basis of the best evidence available. Before thinking about implementation, however, it is necessary to consider capacity, data and methods.

Capacity building

Planning a comprehensive cancer control programme is complicated and challenging. Before there can be any output, a lot of work must be put into capacity building. The Centers for Disease Control and Prevention in the USA have developed a model that could be helpful for building national programmes in Europe [1]. This model involves enhancing infra-structure, mobilizing support, building partnerships and starting an evaluation process. It is important to stress that even a perfect plan, based on all the available evidence, will not be of much use, however, if the infrastructure has not been established and the resources for implementation have not been allocated.

Data-driven approach

Cancer prevention plans should build on descriptive epidemiology and data on risk factors. As these vary from one country to another, country-specific priorities must be set. In setting priorities for programme output, account should be taken of information about potential partners and their willingness to collaborate, information on on-going activities and existing expertise, financial and human resources, and also on gaps in information, activities and knowledge.

Data collection must be a continuous process, closely linked to the goals and objectives of the programme. Only with a good surveillance system in place can the effect of a programme be measured (see chapter on Evaluating cancer prevention activities). As data change, new goals can be set and new interventions can be launched.

Comprehensive programmes

Cancer programmes as part of an initiative against chronic diseases

Experience both within and outside Europe shows that there is good public support for the introduction of comprehensive cancer programmes, and these programmes are strongly supported by the World Health Organization. National programmes should be part of an overall, national initiative against chronic diseases, because:

- Many risk factors are not only risk factors for cancer but also cause other diseases. This is true for tobacco, poor nutrition, inadequate physical activity and obesity; it also applies to alcohol consumption and to many adverse occupational, environmental and infectious agents.
- Many countries already have programmes, e.g., for tobacco or alcohol control. The leadership structures of such programmes should perhaps not be changed; instead, the actors should become part of an overall, well-coordinated initiative. This can lead to a broad coalition and to many synergistic effects, increasing the political and social outreach and the overall impact.

This approach also allows for 'no regrets', when there is doubt about the importance of a risk factor, e.g., in the case of poor nutrition or inadequate physical activity and cancer. Even if a cancer risk factor turns out to be less important than anticipated, it is still worth continuing the programme for the other diseases to which the risk factor contributes.

Characteristics of a comprehensive cancer prevention programme

'Comprehensive' implies programmes that consist of a variety of activities and strategic approaches. They build on large coalitions and rely on an approach involving sectors other than that of health. They are based on sufficient human and financial resources and an adequate infrastructure, and they are run over an extended period.

Many examples have shown that the likelihood of behavioural change is greater if programmes are comprehensive. This is true for tobacco control, e.g., in the USA and some Nordic countries; it is also true in the field of nutrition, e.g., in the North Karelia programme; and in sun protection, as shown in Australia. There is plenty of evidence to show that the overall impact is greater than would be expected from the sum of the effects of individual activities.

One line of action in the comprehensive approach is to target the individual, attempting to influence behaviour through cognition. This includes information campaigns and educational initiatives. Brochures, help-lines and other tools support these initiatives. The other line of action addresses the environment. Behaviour is to be influenced through changes in the context. Environmental changes can consist of laws and regulations that impinge on accessibility, exposure, advertising and promotion. Economic measures can influence consumption patterns. Advocacy can lead to partnerships and cooperation with leaders in various sectors of civil society, the labour world and faith institutions, leading to changes in environmental conditions that will enhance healthy behaviour in various settings (see chapter on Theories of health behaviour and change).

Participation

Comprehensive programmes should build on large coalitions and involve partners from many sectors of society. In order to make coalitions work, true participation must be sought. Goals and priorities should be set in a process that involves all stakeholders. The roles and responsibilities of the various players must be defined in a cooperative process. Pre-existing activities should be integrated into well-coordinated umbrella initiatives. Nevertheless, it is important that each partner be allowed to keep its own identity. This is particularly true for NGOs, which must maintain their liberty to oppose government policy and to lobby politicians and government officials.

Importance of advocacy and lobbying

One of the core responsibilities of cancer organizations is to provide information. Information alone is unlikely to change behaviour, however, and information campaigns are very expensive. Therefore, a considerable part of NGO resources should go to advocacy and lobbying.

This is true in building coalitions for national comprehensive programmes and also for more specific activities. The objectives of advocacy are to get support from decision-makers and important role models in civil society for preventive activities and extend them in their own spheres. Often, these people have a wide outreach and high authority. They have the potential to get messages out, convince people to change their behaviour and facilitate changes in environmental conditions.

Examples of advocacy are:

- lobbying politicians to change laws and regulations and to make sure that laws are obeyed;
- gaining media attention and

The nine laws of successful advocacy

Useful information about advocacy from a strategic marketing and communications perspective

1. Have clear, measurable goals for advocacy: "You can never really say what you've accomplished or whether you've accomplished anything at all, unless you have very specific and quantifiable goals against which you can measure your effect."
2. Define who you want to reach and how to get to them: "If you want to sell to fish, don't use skywriting."
3. Design compelling messages that connect with your target audience: "People are busy. They resist change. In order to get their attention and support for change, you have to connect to them by plugging into their belief system, not trying to rewire it."
4. Start with systematic planning and then review and revise it: "The laziest thing people do is go right to tactics." "When the [US] government launched its "Just Say No" campaign, no one did the simple research to learn that teens trusted their peers more than anyone else."
5. Tell people what to do, how to do it and why: "You've done your planning right, created messages that work for your target audience and you have their attention. … They have the facts; they know something needs to be done. … Now is NOT the time to give vague instructions: 'Stop Global Warming.' 'Save Our Oceans.' 'Justice for All.' People have no idea how to do this."
6. Make the case for why action is needed now: "Your dry cleaner closes at seven. The earth will eventually fall into the sun. We panic about the first, but the second will be forgotten before you finish this page."
7. Match strategy and tactics to the target audience: "Politicians respond to a story in direct proportion to how often it [repeats]."
8. Budget for success: "Money may not be the root of all evil, but a shortage of money is nearly always a recipe for failure."
9. Rely on experts when needed: "When you are working on really important issues, use all the firepower you can get your hands on."

Source: "Now Hear This" from Fenton Communication. http://www.fenton.com/resources/nht_report.asp

coverage of preventive issues;
- convincing business leaders to improve working conditions; and
- getting celebrities to act as role models.

It may take some time to build up relationships with politicians, the media and other important people, and this may not be initially rewarding. Nevertheless, advocacy can be very cost-effective. Advocacy can be instrumental in obtaining a law for a massive increase in tobacco taxation or for the introduction and funding of a comprehensive cancer programme or getting the media to talk about prevention issues so that unpaid media coverage reinforces or replaces costly advertising campaigns.

Theory-driven interventions, based on good knowledge of target populations

Interventions are more effective when they are based on an accepted cognitive or environmental theory. It is therefore recommended that programmes and campaigns be based on a sound theoretical framework. It is also important that strategies be culturally appropriate for the target population and that language barriers have been addressed. Pre-testing of strategies and messages is therefore strongly recommended.

Setting priorities in cancer prevention

Even within a comprehensive national cancer prevention programme, priorities must be set. This can be done by
- looking at issues,
- choosing among different fields of activities and settings and
- selecting specific target populations or limiting activities to certain geographical regions.

Setting priorities for issues

When deciding on issues, descriptive epidemiology, risk factors, exposures, attributable fractions and trends in these indicators should be considered. For Europe as a whole, the following priorities can be set:

1st	Tobacco
2nd	Nutrition, physical activity, weight and alcohol consumption
3rd	Early detection
4th	Other cancer risk factors

The first priority in cancer prevention should be tobacco control, and the first goal is to design a comprehensive tobacco control programme. There is sufficient evidence to show that these programmes do reduce the prevalence of smoking and improve

European Code against Cancer

Many aspects of general health can be improved, and many cancer deaths prevented, if we adopt healthier lifestyles:

1. Do not smoke; if you smoke, stop doing so. If you fail to stop, do not smoke in the presence of non-smokers.
2. Avoid obesity.
3. Undertake some brisk physical activity every day.
4. Increase your daily intake and variety of vegetables and fruits: eat at least five servings daily. Limit your intake of foods containing fats from animal sources.
5. If you drink alcohol, whether beer, wine or spirits, moderate your consumption to two drinks per day if you are a man and one drink per day if you are a woman.
6. Take care to avoid excessive exposure to the sun. It is especially important to protect children and adolescents. If you have a tendency to burn in the sun, you must take active protective measures throughout life.
7. Strictly follow regulations aimed at preventing exposure to known cancer-causing substances. Follow all health and safety instructions on substances that may cause cancer. Follow the advice of national radiation protection offices.

Some public health programmes can prevent cancers from developing or increase the possibility that a cancer can be cured:

8. If you are a woman aged 25 years or over, you should participate in cervical screening, within a programme with quality control procedures in compliance with the European Guidelines for Quality Assurance in Cervical Screening.
9. If you are a woman aged 50 years or over, you should participate in breast screening, within a programme with quality control procedures in compliance with European Guidelines for Quality Assurance in Mammography Screening.
10. If you are a man or a woman aged 50 years or over, you should participate in colorectal screening, within programmes with built-in quality assurance procedures.
11. Participate in vaccination programmes against hepatitis B virus infection.

Source: European Code against Cancer: http://www.cancercode.org/code.htm

health. A comprehensive tobacco control programme encompasses activities in the fields of public awareness and support, protection from environmental smoke, prevention of initiation and cessation of smoking, through individual, community and legislative action. Table 1 lists the types of activities that should be part of a comprehensive programme and in which NGOs can become involved, with a selection of effective interventions given as examples. (For details, see the chapter on Tobacco).

Poor nutrition, inadequate physical activity, overweight and alcohol consumption are considered important issues in the primary prevention of cancer, and a comprehensive programme should cover the four topics in a balanced way. Experience with interventions shows that particular emphasis must be given to changing the environment. Strategies that rely mostly on cognitive approaches to the individual are unlikely to have a sufficient impact.

Alcohol is included in this group, even though most European countries have programmes to reduce excessive drinking. The primary goal of these campaigns, however, is to control binge drinking in order to reduce accidents and violence, whereas the main goal with regards to cancer is to reduce the total amount of alcohol consumed. Table 2 gives an overview of these measures. (For details see the chapters on Diet, Physical activity and Alcohol.)

The obesogenic epidemic

> Control of the obesogenic epidemic will require the participation of all segments of society and substantial investments, particularly in public education, community environments that promote walking and other physical activities, work-site and school programmes that include at least one hour of physical activities on most days, and transportation systems that encourage walking and the use of bicycles.

Source: International Agency for Research on Cancer.

IARC handbooks of cancer prevention, Vol 8, Weight control and physical activity. Lyon: IARCPress, 2002.

Table 1

Goal-oriented NGO actions for tobacco control. Options for action can be grouped according to the major areas of tobacco control: awareness, protection, prevention and cessation. Specific activities are provided only as examples and are not meant to imply that they should be chosen above other options. The activities imply adequate institutional and funding support as well as meeting training needs.

Area	Type of activity	Examples
Public awareness and support	Advocacy and coalitions:	Collaborative activities, including lobbying, letter-writing, public statements, press conferences, monitoring of tobacco industry
	Information campaigns:	Posters, manuals, Internet sites about all aspects of knowledge: e.g., health effects, tobacco industry manipulations, best practices for cessation, factors in uptake
	Health promotion: (making healthy choices easier)	Enforced non-smoking areas in all centres for cancer care and support; campaign to eliminate cigarettes as a fashion accessory in magazines
	Litigation:	Public information about current trials and reasons behind them
	Research:	Survey of public support for new tobacco control laws
Protection	Advocacy and coalitions:	Lobbying for enforced clean air policy in all public places; media campaign to get public support
	Information campaigns:	Material about consequences of exposure to tobacco smoke on fetuses, infants, children, adolescents, men, women
	Specific programmes:	Non-smoking new parents' club with cessation intervention available
	Litigation:	Legal sanctions for non-compliance with current tobacco control laws, e.g., indirect advertising
	Research:	Analysis of barriers to health policy adoption
Prevention (barriers to initiation)	Advocacy:	Public informed through various media about youth strategy of the tobacco industry; campaigns to ban tobacco advertising and higher taxes on tobacco products
	Information campaigns:	Material about the role of parental smoking in uptake by youth
	Health promotion:	Sponsorship of youth (non-smoking) sports clubs
	Specific programmes:	Community anti-tobacco programme: e.g., teachers and parents quit, youth design posters, support to quitters
	Research:	Innovations in eliciting peer support for non-smoking
Cessation	Advocacy:	Lobby for price increases
	Information campaigns:	Where to go, what exists to help people stop smoking
	Specific programmes:	Brief cessation programmes in various health-care settings
	Research:	Innovative peer-support programmes for adolescent quitters

Table 2

Goal-oriented NGO actions for achieving a healthy diet and avoidance of obesity through healthy food choices and moderate levels of physical activity. The following table provides examples of NGO activities that would support the choice of diets and alcohol intake consistent with cancer prevention, and balanced by moderate activity to prevent obesity. These activities alone cannot change health behaviour but should be complementary to community actions in voluntary, private and public sectors and actions at policy, community and individual levels.

Area	Type of activity	Examples
Public awareness (a) the role of diet and physical activity in cancer prevention; (b) practical aspects of a healthy diet and ways to increase activity; (c) avoiding misinformation	Advocacy and coalitions:	Provision of consistent information and advice at points of purchase, food labelling, 'signposting'
		Provision of consistent, clear, specific messages and guidelines by recognized agencies independent of the food industry
		Training of health professionals, including medical staff at medical school and at post-graduate level
	Information and health promotion:	Posters, manuals, internet sites on all aspects of knowledge about the positive health benefits of a healthy diet, increased activity and obesity avoidance
		Assisting in the design and delivery of practical education on food skills in schools and communities
		Dealing effectively with misleading health claims
	Litigation:	Understanding effective communication, role of positive messages, areas of consumer confusion
Increasing intake of fruit and vegetables and Promoting a healthy balanced diet	Advocacy and coalitions:	Lobbying for nutritional standards and for minimum provision of fruit and vegetables in public eating facilities
		Advocacy to administrative groups and health care providers
		Advocacy to the media to make messages on nutrition an issue through editorials; advocacy through important role models
		Advocacy for regulation of advertising of energy-dense foods and fast foods, especially that directed at children
	Information and health promotion:	Advocacy of price promotions, such as free vegetables with main meal, in the public sector
		Promotion of fruits and vegetables in medical prescription-type programmes, school curricula, teachers' training , meals services, catering
		Promotions at point of sale
		Free fruit in school programmes
	Research:	Identification of effective ways to increase vegetable consumption by children, identifying cultural barriers and opportunities for change
Preventing obesity	Advocacy and coalitions:	Lobbying for opportunities to increase physical activity (in all settings) and choice of nutrient-dense foods at reasonable prices
	Information and health promotion activity:	Informing the public about energy-dense foods, sweetened drinks, large portion sizes and 'poor nutritional value' promotions
		Making the public aware of the cut-off points for overweight and obesity Preventing obesity in schools
		Screening for high-risk patients (e.g., body mass index > 25 kg/m2)
		Sponsoring walks, runs, games
	Litigation:	Addressing false promotions and claims on products marketed as healthy when they are more likely to contribute to obesity
	Research:	Identifying effective approaches to avoiding weight gain (at any age, weight or body mass index)
Increasing physical activity	Advocacy and coalitions:	Directing advocacy to influential role models, national, regional and local decision-makers, grass-roots and 'grass-tops' activists
		Legislation, implementation and monitoring for minimum standards for exercise classes and facilities in schools
	Health promotion and information campaigns:	Promotion of exercise on prescription Developing innovative peer-support exercise (e.g. dance) programmes for adolescents
		Publicizing where to find exercise facilities in local communities, low-cost or free ways to increase energy expenditure (e.g. marked kilometre walks in cities) and the appropriateness of changing exercise habits at any age
	Litigation	Legal sanctions for failure to implement exercise facilities in schools
	Research	Exploring consumer preferences for access to healthy foods and increased activities, e.g., transport needs
Appropriate alcohol consumption	Advocacy and coalitions:	Lobbying for an effective alcohol consumption policy in relation to supply factors, especially for young people
	Health promotion and information campaigns:	Setting up alcohol education programmes in schools aimed at enhancing skills (resistance to pressure); targeted information
	Litigation:	Legal sanctions for non-compliance with supply reduction, pricing policy, age restrictions, outlet density and hours of sale
	Research:	Exploring how to change the cultural acceptability of excess alcohol intake

Screening is an effective method for controlling cancer when offered in an organized programme with quality assurance at all levels and good information about benefits and risks. The necessary resources must be available to assure proper organization and quality control. The decision to implement a cancer screening programme is therefore made nationally or regionally, depending on the disease burden and the health care resources. At present, the following cancers can be recommended for screening: cervical cancer in accordance with European Union guidelines for quality assurance, breast cancer screening with mammography in compliance with European Union guidelines for quality assurance and colo-rectal screening with the faecal occult-blood test in programmes with built-in quality control procedures. The possible domains of action, measures and desired outcomes are listed. (More details can be found in the chapter on Screening.)

Cancers related to infections account for a large proportion of cancers in the liver (hepatitis viruses), stomach *(Helicobacter pylori)* and cervix (human papillomaviruses). Occupational carcinogens might well be of importance in individual countries or for specific groups. It is therefore important to take national or even local data into consideration in setting priorities (see also below, 'Setting priorities for target groups and geographical regions'). Information should be made available about protection against ultra-violet (UV) radiation, although priority should be given to early diagnosis of skin cancer for a rapid impact on morbidity and mortality. Environmental carcinogens, from pollution or of natural origin, are of relatively little overall importance in Europe. Monitoring to detect peaks of specific compounds, for example in the industrial setting, should be maintained in order to direct ad-hoc interventions.

Measure	Desired outcome
Legislation and policy	
Implement organized, proven screening	Reduce incidence and mortality
Provide staff and adequate resources	More efficient organization
Ensure quality assurance: accreditation, guidelines, audit, evaluation	Improve security, results, accessibility, quality and effectiveness
Information and communication	
Advocacy and information campaigns	Raise professional and public awareness, increase participation
Provide information (e.g., leaflets, websites)	Empower individuals
Training	
Train health professionals and all others involved	Ensure equity and quality
Research	
Investigate behaviour and costs Develop new screening tests, innovative approaches	Improve effectiveness and benefit–cost ratio

Setting priorities for activities and settings

Changing laws and regulations through lobbying

In tobacco control, it has been shown that taxes, advertising bans, clean air regulations, regulation of packaging and product contents and litigation all have measurable effects on consumption. In alcohol control programmes, it has been shown that taxes, age restrictions, reductions of outlet density and hours of sale, restrictions on advertising and warning labels all decrease consumption. Laws and regulations have been important in reducing occupational and environmental exposures. Much less experience has been gained in the fields of nutrition and physical activity, although there are a few examples, such as improving school lunches and building bicycle lanes.

Circumstantial evidence indicates that lobbying by NGOs helps change laws and regulations. Lobbying and advocacy should therefore be priorities in NGO activities.

General information

In tobacco control, general information for the public is usually not by itself sufficient to change behaviour. Providing information to the general public on the effects of alcohol consumption has a limited effect on beliefs and attitudes and, on its own, is also unlikely to change behaviour. There is weak evidence for a modest effect of interventions for preventing obesity. Therefore, expensive public information campaigns outside of a comprehensive effort are not recommended. However, NGOs should run Websites or produce brochures and other inexpensive tools to disseminate basic information to the public.

Medical setting

Brief interventions by medical professionals to help patients stop smoking have been shown to have a significant effect and are highly cost-effective. Brief interventions could also significantly reduce alcohol consumption. The evidence is less strong for the promotion of healthy eating, loss of body weight and increasing physical activity. Interventions in these areas tend to be more effective if they are directed at risk groups. Weight management programmes are most effective if they are supported by trained personnel and if they are run in a group setting, with behavioural modification techniques and exercise management.

The medical setting is important with regard to early diagnosis and screening. A decision on whether to screen depends on the opinions and knowledge of health professionals. The quality of diagnostic tests also lies in the hands of doctors.

Because some interventions can be highly cost-effective, close collaboration with the medical community and medical associations is strongly recommended and must be part of a comprehensive programme. One important aspect of this collaboration is enabling medical professionals to communicate with their patients on the basis of evidence, leading to shared decision-making, ensuring that patients fully understand the benefits and risks of a given intervention.

Work sites

Occupational exposure to certain carcinogens is an important health hazard for part of the workforce and should be addressed by cancer organizations. In addition, the work site is a good setting for general health promotion.

Legislation to control smoking in the work place eliminates the risk of involuntary exposure to tobacco smoke, reduces the risk of fires and may provide support to smokers who want to quit. Policies for alcohol consumption in the work place that involve employees and thus reduce the rates of dismissal yield significant benefits to enterprises and lead to decreased health-care costs, reductions in disabilities due to illness and substantial decreases in accidents, both on and off the work premises [2].

Nutrition programmes in the work place result in modest

improvements in nutritional behaviour. Extended programmes, such as individual assessments and behavioural counselling, are more successful than simple programmes; however, any change in eating behaviour appears to last as long as the intervention is sustained, suggesting that long-term health policies are needed in the work place [2].

Schools

Only a short delay in initiation of smoking has been found when tobacco control activities in schools are not part of a comprehensive effort. A multidisciplinary approach targeting overweight students and their parents, teachers and the school environment appears to be effective in reducing obesity. In alcohol prevention, a small effect is observed when the social influence approach is used, alone or in combination with the social enhancement approach. A number of studies on protection from UV radiation from early childhood to late adolescence showed better knowledge and changed attitudes but no long-lasting behavioural change.

Interventions in schools should therefore be part of larger programmes, involving parents and communities, and they should rely not only on a cognitive approach but also aim at changing the environment. Health issues should be addressed within the wider concept of health promoting schools, whereby members of the school community work together to give students integrated positive experiences and structures to promote and protect their health in formal and informal curricula. The actions include creation of a safe, healthy school environment, the provision of appropriate health services and involvement of families and the wider community.

Communities

There is some evidence for the effectiveness of a community approach in reducing alcohol consumption. In tobacco control, interventions are effective only if they are large, well funded and multifaceted. Again, the importance of comprehensive programmes must be stressed, in which efforts to change the wider context (e.g. laws and regulations, economic incentives, national information campaigns) are combined with local initiatives.

Setting priorities for target groups and geographical regions

A good strategy for increasing the effectiveness and cost-effectiveness of interventions with small budgets is to target not whole populations but well-defined high-risk populations. Targeting reduces the number of people who have to be contacted. Activities and language can be tailored to the target group. Examples of such groups and activities are:

- workers exposed to carcinogens: information and protection
- socioeconomically disadvantaged groups in existing programmes, e.g., for cervical cancer screening: increase participation rate;
- people with high-risk skin types: promote protection from UV radiation and early diagnosis of skin cancer;
- people living in buildings with high radon concentrations: make them aware of the danger and help them to protect themselves;
- people in screening programmes: offer educational programmes about changing life style.

The high-risk strategy

The search for more efficient preventive policies had led to the high-risk strategy, in which efforts are focused on people considered mostly likely to develop disease. This obviates the wastefulness of the mass approach, which interferes with people, most of whom neither ask for help nor will benefit from it.

The high-risk strategy of prevention implies segregation of a minority with special problems from a majority who are regarded as normal and not needing attention. Whether this is reasonable depends on the extent to which a particular risk is indeed confined to an identifiable minority, but our ability to discriminate in this way may be inadequate. Concern for the welfare of individuals may be good for those people; concern for the health of the public as a whole points us in a different direction. We must consider the implications of a situation in which a small risk involves a large number of people, who in the high-risk strategy would be categorized as normal. The result for the population may be a large number of cases, even though no one was at a conspicuous risk. A population strategy of prevention is necessary whenever a risk is widely diffused throughout the population.

Source: Rose G. (1985). Sick Individuals and sick populations.

Int. J. Epidemid. 14, 32-8.

Another good strategy is to limit a programme to a geographical area. This can be done as a pilot project. If it is successful, the intervention can later be generalized, and, if there is evidence of effectiveness, funding might be easier to find. Limiting a programme to a small target group or geographical area does not imply that individuals are targeted with only cognitive approaches. A good project could also aim at changing the local environment, e.g., increasing the number of bicycle paths.

Conclusions

National cancer control programmes

Prevention is easy if it goes hand in hand with general social change. The example of stomach cancer is illustrative. As Europeans became more affluent, they changed their diet and began eating fresh meat, instead of salted and smoked meat, and more fresh fruit and vegetables. These changes resulted in a decrease in the incidence of stomach cancer. Prevention was thus achieved without any specific intervention. Widespread cigarette smoking is, however, also an outcome of affluence, and, as we all know, fighting tobacco consumption has been long and difficult.

Unfortunately, the new challenges posed by physical inactivity and intake of large amounts of fat and sugar resemble those presented by the tobacco epidemic: the behaviour is unhealthy but is often promoted by powerful economic interests. Television advertisements, food displays in supermarkets, our modern way of working and the ways our buildings and roads are constructed all contribute to an unhealthy lifestyle. Preventive messages are launched into a sea of information where most of the other messages work against us. This is the challenge health promotion has to face today.

In order to succeed, national cancer control programmes must become powerful, effective and cost-effective. The best means is to build large coalitions and involve partners from many sectors of society. Decision-makers in the fields of politics, economics and society at large must be convinced to work together to promote a healthy environment and healthy life styles.

It is the task of cancer organizations to build these coalitions and to promote national cancer prevention programmes. In the early phases, they should offer resources, know-how and infrastructure for initial capacity building, and they should make sufficient financial resources available for the early planning activities. Once a national cancer prevention programme has been established, the government should be encouraged to take over its funding. NGOs should then move on to new tasks, taking on new roles and filling other gaps.

When choosing fields of activity for a national cancer control programme, national epidemiological data, data on risk factors and on-going public health activities should be considered. In view of the burdens of disease and the fractions attributable to the various risk factors in Europe, most resources should be channelled into tobacco control and programmes addressing nutrition, physical activity, weight control and alcohol consumption. These fields may already be covered in the activities of other institutions. Therefore, national cancer control programmes should be run as broad coalitions. NGOs should accept that their public prominence might sometimes have to stand back to some extent. Yet, giving each organization its niche still allows for positive public relations. The niche might be a certain target group, like young people or the elderly, or a specific setting, such as the medical community or work sites. This is a typical win–win situation, where a coalition has synergistic effects and each organization involved receives its own promotion.

There are also cancer-specific fields within a national cancer control programme. These include early detection of cancer and prevention of occupational cancer. Serious deficits often exist in these areas, so that NGO activities are necessary and offer good opportunities for public appearances, thereby meeting NGOs' legitimate public relations needs.

Once the fields of activities are decided upon, it is essential that the interventions lead effectively to improved health outcomes. This report summarizes present knowledge about effective interventions in cancer prevention. Choosing interventions that have been proven to be effective will increase the likelihood of success. Nevertheless, changing behaviour is a complex undertaking, as it is influenced by many personal, social, economic and cultural factors. These factors differ among countries, among target groups and even among communities. Choosing interventions that have worked in one country or in a specific setting is no guarantee for success when they are repeated in another context. Interventions and programmes must therefore be locally adapted, and they must be evaluated to ensure that they work and that the programme goals are being met.

Measuring outcomes implies a good surveillance system which also provides data for future programme development. We continually have to create our own new evidence! And it is important that results are published, so that can we learn from each other and thereby further improve effectiveness and cost-effectiveness.

Designing comprehensive national cancer control programmes is a huge challenge. The best available knowledge should be applied. International collaboration is important. Taking advantage of the available expertise is strongly recommended.

Help and services

When developing national cancer programmes, you can get help at:

UICC: http://www.uicc.org/

Centers for Disease Control and Prevention (USA): http://www.cdc.gov/cancer/

World Health Organization: http://www5.who.int/cancer/main.cfm?s=0009

UICC will be happy to coordinate exchanges of ideas and expertise among programme leaders and to give advice on training workshops for staff. Please call the Cancer Prevention and Early Detection Department of the UICC, at telephone +41 22 809 18 11.

The Centers for Disease Control and Prevention and the American Cancer Society also have a number of educational offers.

Key references

1. Centers for Disease Control and Prevention. Guidance for comprehensive cancer control planning, Vol 1, Guidelines, Atlanta: Division of Cancer Prevention and Control, Centers for Disease Control and Prevention, 2002.
2. International Union for Health Promotion and Education. The evidence of health promotion effectiveness, shaping public health in a new Europe, Part 2, Evidence book, Brussels: European Commission, 2000.
3. World Health Organization. National cancer control programmes, policies and managerial guidelines, 2nd Ed., Geneva: World Health Organization, 2002.

Abbreviations

ABV	*alcohol by volume*
ASR	*age-standardized rate*
ASRW	*age-standardized rate (world)*
DALY	*disability-adjusted life years*
EBV	*Epstein-Barr virus*
EU	*European Union*
FAO	*Food and Agriculture Organization of the United Nations*
FCTC	*Framework Convention on Tobacco Control*
HBV	*hepatitis B virus*
HCV	*hepatitis C virus*
HH8	*human herpesvirus-8*
HIV	*human immunodeficiency virus*
HPV	*human papillomavirus*
IARC	*International Agency for Research on Cancer*
MALT	*mucosa-associated lymphoma tissue*
MOP	*mechlorethamine, oncovin (vincristine), procarbazine and prednisone*
PAH	*polycyclic aromatic hydrocarbon*
Pap	*Papanicolaou*
PSA	*prostate-specific antigen*
QALY	*quality-adjusted life years*
SPF	*sun protection factor*
UV	*ultraviolet*
UVI	*ultraviolet index*
WHO	*World Health Organization*

Definitions for terms used in this Handbook may be found in the following glossaries:

The Canadian Cancer Society Bilingual Glossary – English/French
http://info.cancer.ca/e/glossary/glossary.html

Swiss Cancer League Glossary in French
http://www.swisscancer.ch/fr/content/tuerkis/krankheitkrebs_glossar.php

French League Against Cancer Glossary in French
http://www.ligue-cancer.asso.fr (then click Glossary)

Centers for Disease Control Glossary, USA
http://www.cdc.gov/reproductivehealth/epi_gloss.htm#top

National Cancer Institute Glossary, USA
http://www.nci.nih.gov/statistics/glossary

Authors and contributors

Professor Annie Anderson
Centre for Public Health Nutrition Research
Department of Medicine
Ninewells Hospital and Medical School
University of Dundee
Dundee DD1 9SY, Scotland
United Kingdom

Dr Paola Armaroli
CPO Piemonte (Centre for Oncological Prevention)
and ASO S.Giovannni Battista
via San Francesco da Paola, 31
10123 Torino
Italy

Ms Brigitte Baschung
Nationale
Krebsprâventionsprogramme
Krebsliga Schweiz
Effingerstrasse 40
CH-3001 Bern
Switzerland

Dr Volker Beck
Deutsche Krebsgesellschaft
Steinlestrasse 6
D-60596 Frankfurt/Main
Germany

Dr Andreas Biedermann
Oncosuisse and
Swiss Cancer League
Effingerstrasse 40
CH-3001 Bern
Switzerland

Dr F. Xavier Bosch
Institut Català d'Oncologia
Epidemiology and Cancer Registration Unit
Avda. Gran Via s/n km 2,7
08907 L'Hospitalet de Llobregat
Barcelona, Spain

Professor Franco Cavalli
Oncology Institute of Southern Switzerland
Ospedale San Giovanni
CH-6500 Bellinzona

Dr Christine Defez
Epidaure
Department of Epidemiology and Prevention
CRLC Val d'Aurelle
F-37298 Montpellier Cedex 5
France

Professor Gianfranco Domenighetti
Department of Health and Social Welfare
Via Orico 5
CH-6500 Bellinzona
Switzerland

Dr Mikael Fogelholm
The UKK Institute for Health Promotion Research
POB 30
33501 Tampere
Finland

Dr Silvia Franceschi
International Agency for Research on Cancer
150 cours Albert Thomas
F-69372 Lyon Cedex 08
France

Dr René Lambert
International Agency for Research on Cancer
150 Cours Albert Thomas
F-69372 Lyon Cedex 08
France

Dr Fabio Levi
Cancer Registry of the Canton of Vaud
Registre vaudois des tumeurs
CHUV-Falaises 1
CH-1011 Lausanne
Switzerland

Professor Elsebeth Lynge
Institute of Public Health
University of Copenhagen
Blegdamsvej 3
DK 2200 Copenhagen
Denmark

Professor Ulrike Maschewsky-Schneider
TechnischeUniversität Berlin
Institut für Gesundheitswissenschaften
TEL 11-2
Ernst-Reuter-Platz 7
D-10587 Berlin
Germany

Dr Franco Merletti
Unit of Cancer Epidemiology
University of Turin and
Center for Oncologic Prevention
via Santena 7
I-10126 Torino
Italy

Dr Anthony Miller
Box 992, 272 King Street
Niagara on the Lake
Ontario, L0S 1J0, Canada

Dr Dario Mirabelli
Unit of Cancer Epidemiology
University of Turin and Center for Oncologic Prevention
Via Santena 7
I-10126 Torino
Italy

Dr Philippe Mourouga
Ligue Nationale Contre le Cancer
14, rue Corvisart
F-75013 Paris
France

Dr Richard Müller
Swiss Institute for the Prevention of Alcohol and Drug Problems
Avenue Ruchoment, 14
CP 870
CH-1003 Lausanne
Switzerland

Dr Paola Pisani
International Agency for Research on Cancer
150 cours Albert Thomas
F-69372 Lyon Cedex 08
France

Dr Josepa Ribes
Institut Català d'Oncologia
Servei d'Epidemiologia i Registre del Càncer
Gran Via, s/n km 2,7
08907 Hospitalet de Llobregat
Barcelona
Spain

Professor Hélène Sancho-Garnier
Epidaure, Department of Epidemiology and Prevention
Centre Régionale contre le cancer, Val d'Aurelle
F-37298 Montpellier Cedex 5
France

Dr Nereo Segnan
CPO Piemonte (Centre for Oncological Prevention)
and ASO S.Giovannni Battista
via San Francesco da Paola, 31
10123 Torino
Italy

Dr Karen Slama
International Union Against Tuberculosis and Lung Disease
68 Boulevard Saint-Michel
F-75006 Paris
France

Dr Bertino Somaini
Foundation for Health Promotion Switzerland
Dufourstrasse 30
Postfach 311
CH-3005 Bern 6
Switzerland

Dr Anne Stoebner-Delbarre
Epidaure,
Department of Epidemiology and Prevention
CRLC Val d'Aurelle
F-37298 Montpellier Cedex 5
France

Editorial working group

Dr Hélène Sancho-Garnier (Chair)
France

Dr Annie Anderson
Scotland

Dr Andreas Biedermann
Switzerland

Dr Elsebeth Lynge
Denmark

Dr Karen Slama
France

Ms Maria Stella de Sabata
International Union Against Cancer

Ms Lohes Rajeswaran
International Union Against Cancer

Swiss Cancer League: From prevention to palliation

The Swiss Cancer League is a national organization that intervenes at political, social and individual levels in the interests of people threatened by or suffering from cancer. Its endeavours make an essential contribution to reducing the numbers of people who fall ill with cancer and who suffer from the consequences of cancer, and increasing the numbers of people who are cured of cancer and who receive care and help.

The programmes and activities of the Swiss Cancer League provide long-term support both to people threatened or affected by cancer and to specialists in the field. The themes of the best-known prevention programmes are protection against the sun, the dangers of smoking, and the importance of a healthy diet. Most of its public campaigns are conducted in coordination with health services, in order to achieve the best possible response. These campaigns include 'Cream Attacks' at open-air events (run with well-known manufacturers of sun-protection products), which have been found to have great appeal. Interactive Internet games to sensitize people to the dangers of smoking, teaching materials for schools and presentations in major distribution centres and canteen kitchens to encourage people to 'eat five portions of fruit or vegetables a day' have also been very popular. Its policy of providing information for early recognition of cancer diseases—particularly breast cancer and bowel cancer—also includes the possibilities and limits of screening, so that an interested person is in a position to make a conscious decision. For several years, the many Cancer League events held as part of 'Breast Cancer Month' (October) have received much attention throughout the country.

The Cancer League's Cancer Helpline call centre, run by professionals, provides a readily accessible point of contact for everyone. The League also offers psychosocial counselling and support to people suffering from cancer and to their relatives, in the 68 advice centres operated by the 20 cantonal Cancer Leagues and by means of free brochures written especially for the purpose.

Health professionals are supported by advanced training courses in palliative care and communication skills and a post-graduate course in psycho-oncology. The Swiss Cancer League proposes a quality management system for clinics, which includes medical and nursing standards and teaching materials in the fields of palliative care, chronic pain and fatigue.

French League against Cancer

The French League against Cancer is a public service association founded in 1918 after WWI when cancer was recognised to be a spreading epidemic. The League's goal is to come to the aid of cancer patients, their family and friends. Since its founding, the League has developed into a strong network and leads the fight against cancer on three levels; research, information and prevention, and psychosocial assistance for patients.

The network

The league is a federation of 102 departmental committees that are active in relaying the mission of the administrative council and the national scientific council. 30 000 volunteers keep the network active by leading the fight and generating the essential resources of the league.

A battle on all fronts

The League believes that the battle against cancer needs to be fought in 3 areas simultaneously:

Support in fundamental and clinical research

70% of resources are dedicated to supporting research. This investment is dedicated to promising projects in fundamental research such as the Tumor Identity Card, in clinical research such as the implementation of new treatments and the improvement of existing treatments, and in social sciences research to make sure that quality of life issues for patients are also taken into consideration.

Prevention and Early Detection

Considering that 50% of cancers could be avoided through access to better information on prevention techniques, the league continuously develops campaigns to inform the public on tobacco addiction, alcoholism, sun exposure, nutrition, and carcinogenic materials. The league is also a partner in the "Pouvoirs Publics" for the implementation of the necessary tools for effective early detection techniques, in particular those for the early detection of breast cancer.

Psycho-social support for patients and their loved ones

Since its founding, the league has been dedicating a large portion of its resources and actions to the social and financial aid of patients and their families. For the past 5 years, under the leadership of their President Henri Pujol, the league has developed programs for psychological assistance allowing patients to break out of their confinement to change social perceptions on cancer. In 1998 the first general assessment of cancer patients took place. For the first time, the general public, health care workers, politicians, and the media took notice of the patients as individuals, and not only the illness affecting them. The league implemented several pilot projects for patients and with patients to assure equal access to the best treatments.

The League's innovations include:

- *Implementing welcome centres in hospitals.*
- *Helping to recruit psychologists and creating positions and training in psycho-oncology.*
- *Creating advocacy groups for networks of patients and their families.*
- *Giving access to patients to a partnership in health and clinical research.*
- *In association with the French federation of hospitals, the league selected projects evaluating the quality of life felt by the cancer patient.*
- *The French Federation of Comprehensive Cancer Centres (FNCLCC), and the league created committees of patients and doctors responsible for therapeutic trials to improve the information received by patients after undergoing treatment.*
- *Launching a phone service – Ecoute Cancer – offering an anonymous helpline manned by informed professionals.*
- *Creating interactive online forums, one for patients and their relatives, another for young cancer patients.*

The League is proud to have contributed to a new outlook on cancer and have successfully participated with the implementation of a national cancer control plan which the President of the Republic, Jacques Chirac, has listed amongst the top national priorities.

With 630 000 members, 30 000 volunteers, 102 departmental committees and 300 salaried staff, the League is a major player in the fight against cancer in France today.

International Union Against Cancer

Growing global cancer burden
Each year, 6 million people die from cancer, and 10 million new cases are diagnosed. If current global trends continue, an estimated 10 million people will die of cancer in 2020, and the number of new cases will increase to 15 million per year. In today's world, each and every person will be touched by cancer either as a patient, a family member or a friend. If rising global trends are to be reversed, then present knowledge must be put into effect on a wider scale.

Cancer is a worldwide public health problem
Often cancer is regarded as a disease of the developed world, but as developing countries experience improved living standards and longer life expectancy, cancer incidence is on the rise. In most developed countries, cancer is already the first leading cause of premature death, and epidemiological evidence points to the emergence of the same trend in developing countries. By 2020, an estimated 60% of all new cancer cases will occur in the developing world. Responsible for 12% of all deaths worldwide, cancer claimed twice as many lives as AIDS in 2002.

Concerted effort towards cancer control
As the largest independent, non-profit, non-governmental association of 280 cancer-fighting organisations in over 80 countries, UICC is a global resource for action and voice for change. UICC brings together individuals in the global campaign against cancer from a wide range of organisations including advocacy groups, patient and survivor support networks, voluntary cancer societies, public health authorities, and research and treatment centres.

UICC, its vision and mission
UICC is the only international nongovernmental organisation that is dedicated solely to the global control of cancer. Its vision is of a world where cancer is eliminated as a major life-threatening disease for future generations.

UICC's mission is to build and lead the global community that is engaged in
- *sharing and exchanging cancer control knowledge and competence equitably,*
- *transferring scientific findings to clinical settings,*
- *systematically reducing and eventually eliminating disparities in prevention, early detection, treatment and care of cancers, and*
- *delivering the best possible care to all cancer patients.*