Social Inequalities and Cancer
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Poverty and cancer

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Despite the attraction of certain utopias and the convincing strength of some of the social and philosophical theories underlying attempts to change the social structure and to achieve a more egalitarian society, social inequalities have not disappeared and seem even to be increasing worldwide. Inequalities in health are part of the social inequalities present in our society and one of their most convincing indices. Sanitary conditions are worse, mortality higher, survival rates of cancer patients lower, and life expectancy shorter in developing countries than in industrialized countries. Similar if not identical differences can be seen within industrialized countries between socioeconomically less and more favoured population groups. In many areas of the industrialized countries social and environmental conditions comparable with those existing in the poorest countries last century have been recreated. Occupational risks are becoming a serious problem in developing countries, largely as a consequence of the transfer of hazardous industries from industrialized countries where certain industries are judged to be unacceptable. A similar double standard is applied to tobacco advertising and sales in the industrialized and developing countries. The projections of the total number of cancer cases in the next decades indicate a generalized increase, proportionally greater in developing than in industrialized countries.

Despite many attempts in various periods of human history to achieve an egalitarian society by distributing wealth and reducing poverty, and despite the attraction of certain utopias and the strength of several social and philosophical theories, social inequalities have not disappeared and seem even to be increasing worldwide. Inequalities in health are just part of the social inequalities present in our society and are one of their most convincing indices (Susser *et al.*, 1985).

The identification of causes and mechanisms behind the origin and persistence of poverty in Western society has perhaps been an achievement for sociologists and philosophers, but it has not led to a comparable achievement in the prevention of social disparities around the world (Kosa & Zola, 1976). The incapacity of our society to eliminate poverty is indeed one of the most blatant examples of failure in prevention. Similarly, the identification of the causes of a considerable proportion of human cancers, including natural substances like tobacco and asbestos, as well as industrial chemicals, medical drugs, radiation and viruses (Tomatis, 1990; Tomatis *et al.*, 1989), has been a great achievement by laboratory scientists and epidemiologists, but up to now has been followed by only limited victories for cancer prevention. The accumulated knowledge of the etiology of cancer has in fact not been applied with the efficiency necessary to achieve a substantial reduction in the incidence of at least certain human cancers. By some perverse mechanism this failure has been attributed more to inadequacy of etiological knowledge than to inefficiency in its practical use in prevention. In this way, the role of the environmental carcinogenic agents so far identified, with the single notable exception of tobacco, has been unjustifiably downgraded.

Poverty can be defined as a form of inequality below certain limits, thus implying that not all conditions that are just below the average within a given social environment can be considered as poverty. It may also be interpreted as a relative concept. If poverty is defined in relation to the average conditions in a given society, and what is measured is the extent of the inequality, then the proportion of people experiencing such poverty in a poor country is lower than in a rich country. In a poor country, most people generally share conditions close to the average for the country, but in a rich country a greater proportion of people are likely to share living conditions distant from the average and below the threshold of poverty, or at least of what can be called relative poverty.

In today's society the phenomenon of relative deprivation appears to be shifting the border of poverty upwards by including people who must renounce non-essential goods, like for instance vacations or a car. At the same time, the gap between the very rich and the very poor is widening and the proportion of the very poor – those who lack essentials – is increasing.

Poverty measured purely by its economic dimension (which is likely to underestimate its true dimensions) is still well rooted even in rich parts of the world. In 1985, 15.4% of Europeans (14.4% of all families) were considered poor, with Portugal and Ireland at one extreme with 32.7% and 19.5%, respectively, considered poor, and Belgium and Denmark at the other extreme with 5.9% and 8.0%, respectively, considered poor. In Italy in 1985, the proportion was 14.2%, but it had risen by 1988 to 15.2% (Commissione d'Indagine sulla Povertà e l'Emarginazione, 1992). In the United States of America in 1993, 15.1% (39.3 million) of the population (an increase of 0.3% from 1992) were living below the poverty line, which was set at US$ 14 763 a year for a family of four (Anonymous, 1994).

In discussing poverty and health, one enters a territory in which the borders between public health, the social sciences and politics are indistinct. Sigerist (1956) stated, on different occasions, that 'in any given society the incidence of illness is largely determined by economic factors' and that 'the problem of public health is ultimately political'. The great scientist of the last century Rudolf Virchow (Ackerknecht, 1981) must have shared this view when he was fighting for his idea of public health and social justice, at the risk of appearing an outmoded anticontagionist. He and another eminent scientist, Max von Pettenkofer (Hume, 1927), achieved an improvement in living and sanitary conditions in Berlin and Munich that resulted in a decrease of infant and infectious disease mortality. Such a decrease would not have been obtained if the purely scientific view of the contagionists, who were nevertheless scientifically correct, had totally prevailed at that time. McKeown (1988), in a more guarded statement that would have been shared by Winslow (1980), proposed that 'poverty is not a direct cause of disease, but it is the main determinant of influences that lead to disease'.

In this context, the German physician Johann Peter Frank from Göttingen deserves a special mention. Frank won the Chair of Clinical Medicine in Pavia in 1784, and in 1786 became Director General of Public Health of Lombardy, which was then under Austrian domination. In 1790 at the University of Pavia, he delivered the famous speech entitled 'De Populorum miseria: morborum genitrice' (Frank, transl. 1941). Under any form of government, he said, we may expect that the rich and the poor will have diseases peculiar to them, following the inevitable law of social disparity. He was deeply concerned, however, by the 'tremendous consequences for the public health of the extreme poverty from which the greater and most useful section of the population is being crushed'. Frank was not a revolutionary, but rather a loyal subject of King Joseph II, and tried, passionately but without success, to persuade authorities of the need for social reform to improve the people's health – however, all that he obtained was a call to return to Göttingen.

Economics and health

There has been a tendency recently to consider health as being purely, or mainly, an economic problem. There are various and severe limitations in the contributions that economics can make to public health (Fuchs, 1993). Economics by itself will not explain why different people give different emphasis to health care or to public health, nor clarify the criteria by which public health may become a priority, nor identify the sociocultural characteristics of a society or of an era within which the preferred choices are not necessarily in harmony with economics *sensu stricto*. While economics will be able to explain the costs that an equitable health system may imply, it will never explain why some people may prefer such a system, even if it would mean a slowing down of technological advances.

Civil rights originated and developed from deep moral and religious roots. These original foundations still exist and must continue to exist to support the moral commitment, which has been modified, but certainly not eliminated, by the secularization of society. While the extension of rights to all citizens should be connected with a due emphasis on reciprocal obligations, the definition of how much equality current society would like to achieve and the degree of social differences it would be ready to accept remains very difficult. The difficulties actually begin when we try to define what it is that

separates a difference from an inequality and, furthermore, where and when a need becomes a right and a legitimate right (Pennacchi, 1994).

Health expenditures account for a considerable and increasing proportion of the gross national product (GNP) in industrialized countries (La Santé en France, 1989; Saracci, 1990; Geddes, 1991; Nau, 1991; Anonymous, 1991). This has not resulted in proportionate gains in public health. One of the major reasons for the lack of correspondence between increase in expenditure and improvement in well-being is probably that no more than 2–3% of the budget for health is usually earmarked for prevention; another is that it is generally the segment of the population that most needs health care that has the least access to it. A third, and perhaps the main, reason is that investment in health has been seen too often in terms similar to investment in other sectors of the economy and has thus been conditioned by the same imperatives of profit that drive industries or private enterprises. As the real 'profit' produced by health services – that is, the improvement of health status – is not easily quantifiable, all expenditures in public health are seen as low priorities.

The USA spends about 13% of its GNP on health (Fuchs, 1993) despite the fact that about 15% of its population is not covered by health insurance and therefore does not have access to a health protection system (Gibbons, 1991). As a comparison, the United Kingdom spends about 7% of its GNP on the National Health Service, which covers the entire population.

General and infant mortality

Several attempts to improve public health were made in some countries at the time of the Renaissance (Cipolla, 1976; Cipolla *et al.*, 1992), but the first official recognition of the necessity to intervene in favour of the poor in general, and of the working class in particular, was made in the last century (The Chadwick report on the sanitary condition of the labouring population, 1971; Rosen, 1993).

In 1828, the French physician Villermé recorded the sharp contrasts between death rates in the rich and the poor and noted that infant and childhood mortality was almost twice as high among the poor as among the wealthy (Villermé, 1928; Coleman, 1979). Benoiston de Châteauneuf, a friend and contemporary of Villermé, provided unassailable evidence that differences in age-specific mortality increase with age, with practically none of the poor reaching old age (Benoiston de Châteauneuf, 1830). About 10 years later similar differences in mortality among people living in rich and poor residential areas were observed in the United Kingdom (Shryok, 1979; Strong, 1990).

Disease and destitution may have been considered part of the inscrutable plan of the Almighty, but when the injury and death of the workers interfered with industrial production and put profit in jeopardy, and when infectious diseases spread from poor to rich districts, it was time to take action. It was indeed pointed out that some sanitary and hygienic measures had to be taken because they were 'necessary not less for the welfare of the poor than the safety of property and the security of the rich' (Rosen, 1993). The famous Chadwick report on the 'sanitary condition of the labouring population' of Great Britain (1971) was published in 1842, largely as a result of the initiative and perseverance of Edwin Chadwick. Chadwick was a lawyer by education and a disciple of Jeremy Bentham. He was appointed secretary to a newly created Poor Law Board in 1834 and, after it was dissolved, became a member of the new National Board of Health in 1839. His report marked the beginning and formed the basis of the wave of sanitary reforms initiated towards the middle of the last century.

The first compulsory insurance covering the costs of care in cases of diseases and maternity of workers was instituted in Germany by Bismarck in 1883. Austria followed in 1888, Denmark in 1892, Luxembourg in 1902, Norway in 1909, the United Kingdom and Switzerland in 1911, and the Netherlands in 1913; other countries followed after World War I – for instance, France in 1928 and Sweden in 1948. In 1919, the International Labour Organization, of which the International Labour Office is a component, was created with the official and advertised goal of favouring the implementation of social justice worldwide. In 1948, the General Assembly of the United Nations approved the Universal Declaration of Human Rights in which article 25 proclaims that every individual has the right to a standard of living sufficiently high to guarantee his health, as well as full protection against unemployment, diseases, invalidity, widowhood and age, or in any other case of loss of the

means of subsistence. This brief, necessarily incomplete, historical survey of how and when governments have tried to deal with certain social issues provides some elements on which to measure the distance that separates good intention and rhetorical statements from the reality. Such stated intentions seem more likely to have been realized when the egalitarian motivation is subsumed with a precise political goal that has little or only an indirect connection with altruism, as in the case of the initiative taken by Bismarck.

In the twentieth century, United Kingdom mortality rates for tuberculosis, heart diseases, bronchitis and stomach and other cancers were higher among the less favoured social classes IV and V than among the more favoured classes I and II in the 1930s and the same gap existed and had become even wider 50 years later (Greenwood, 1935; Logan, 1954; Wilkinson, 1986; Townsend & Davidson, 1982). A considerable overall improvement in infant survival rates occurred in the United Kingdom after 1921, but the social gradient indicating a higher mortality within classes IV and V did not change in the next 50 years (Rosen, 1993). In the United States, infant mortality has in recent years decreased among Black and White infants, but the disparity in mortality between Black and White infants has persisted or even increased, even when the comparison is made between infants with the same socioeconomic conditions. The chances of a Black infant dying in 1950 and 1988 were 1.6 and 2.1 times greater, respectively, than for a White infant (Schoendorf *et al.*, 1992). This increasing disparity is observed while the absolute infant mortality rates are declining in both White and Black infants, suggesting that the causes of the decline do not substantially affect the disparity (Wise & Pursley, 1992).

The *ad hoc* Working Group on Inequalities in Health that the United Kingdom Labour Government set up in 1977 confirmed that while overall death rates had continued to fall, the difference between the classes remained proportionally the same or had even widened in all age groups. At the time the report of the group (known as the Black report, from the name of its chairman) was completed and ready for distribution, the Labour Government had been replaced by a Conservative Government, which tried to prevent its publication. A limited number of copies were nevertheless later distributed, and the Black report subsequently became available to the public because it was published independently as a paperback (Townsend & Davidson, 1982). The new government claimed that the pursuit of equality in health would hinder the much needed economic growth and that even greater inequality, by permitting faster growth, would give more real benefit to the less favoured than a policy of equal shares for all (Strong, 1990). Although no one has ever been able to provide solid evidence for this conjecture, similar policies still seem to be supported in certain circles in the United Kingdom and elsewhere. A report that was prepared as a follow-up of the Black report several years later also encountered serious difficulties in its publication, as the government tried again, but again unsuccessfully, to prevent it (Whitehead, 1987). A further updating of the study confirmed the persistence and even widening of the differences in health between the more and less favoured socioeconomic groups and re-emphasized the link between health differentials and material conditions, rather than individual behaviours (Phillimore *et al.*, 1994; Wilkinson, 1994).

In most industrialized countries, the distribution of economically active individuals by occupational class has changed with time. The percentage of economically active men in the United Kingdom assigned to classes I and II increased considerably from a combined total of 13.8 in 1931 to 23.2 in 1971, while the percentage assigned to classes IV and V decreased from 38.4 to 26.4 (Townsend, 1982). It might be inferred that inequalities had been reduced, since the segment of society with higher incomes and lower death rates had increased and the one with lower incomes and higher death rates had shrunk. What was also true, however, was that the death rate had fallen much faster in class I than in class V, so that the gap between the rich and the poor grew even greater despite of, and in parallel to, the changes in the sizes of the two classes. The persistence and even widening of such a gap have been further confirmed by a more in-depth and detailed analysis of the relationships between trends in mortality and relative poverty and class differences (Wilkinson, 1989). A relatively new phenomenon is the growing proportion of jobless individuals. Several studies in different countries point to this condition as being associated with particularly severe consequences for health status (Costa & Segnan, 1988; Morris *et al.*, 1994).

Marxist theory, which was seen as forming the background to the Black report, has been heavily criticized for being reductionist, as it gives overriding importance to economic circumstances and, by doing so, underestimates cultural factors. Non-Marxist sociologists and economists have suggested that other modes of class stratification would be more meaningful than the manual/nonmanual distinction. Thus a division has been proposed between, on the one hand, a large middle class whose members are employed, most often own their residences and can afford highly privatized consumption and, on the other hand, an underclass (representing about 25% of the population) that is low-waged or unemployed, lives in rented accommodation, and is highly dependent on public services. This division between a more affluent employed population and the less advantaged underclass has seemed more significant than the conventional Marxist division between manual and non-manual occupation (Pahl, 1984). However, while it is understandable that Marxist theories have incited strong adverse reactions, alternative theories have not yet offered satisfactory criteria to explain and eliminate social and health inequalities. Nevertheless, it is clear that in industrialized countries the original sharp division between manual and non-manual employment has lost much of its original significance. It is thought a sort of modern fraud to use 'the term "work" to cover what for some is... dreary, painful or socially demeaning and what for others is enjoyable, socially reputable and economically rewarding' (Galbraith, 1992). The main reason why privileged members of society oppose all reforms, including a sanitary reform, which while ensuring a general improvement of social conditions would imply an unavoidable increase in taxes, is the obtuse and pertinacious preference given to immediate advantage as compared with a hypothetical better future in a more equitable society, a future that would be better also in the sense that it could prevent a catastrophe from which not even the rich would be protected (Galbraith, 1992).

Marxist-inspired theories have also been accused of ignoring biology, and in particular a possible genetic explanation for the persistence of differences in class-related mortality. While there has been no great support for an explanation of the gap between classes based only, or mainly, on genetic differences, more attention has been paid to the suggestion that there might be a heightened general susceptibility to disease in particular groups. For example, an increased predisposition to cancer and other diseases might go with a lower socioeconomic position, perhaps due to immune suppression related to stress from adverse socioeconomic conditions. However, against this hypothesis stands the heterogeneity in the associations of socioeconomic conditions and specific cancer sites, as well as the clear evidence of the role of environmental/hygienic and behavioural factors, which strongly suggest that no single factor could account for the association seen and for the alleged increased general susceptibility to disease (Susser *et al.*, 1985; Smith *et al*, 1991).

Inequalities in health in industrialized countries

Most of the studies on the relationship between socioeconomic class and cancer have been carried out in industrialized countries and have consistently shown that the total incidence, as well as mortality, of cancer at all sites is higher in the lower socioeconomic groups and is due mainly to an increased incidence and mortality at certain sites. From the classical study of Clemmesen and Nielsen (1951) to the more recent of Kogevinas (1990), it appears that the sites where the differences are the highest are the stomach, lung and cervix uteri. Three large studies in the United Kingdom have consistently found mortality to be higher in low socioeconomic groups for cancers of the lung, stomach, liver and oesophagus, while in one of the studies higher rates were reported also for the bladder, rectum and pancreas (Smith *et al.*, 1991). A study in Italy found the greatest differences for cancers of the lung, pharynx, larynx, stomach, bladder and cervix uteri (Faggiano *et al.*, 1994), and a study in Argentina for cancers of the lung, bladder, larynx and pancreas in males, and for cervix uteri (Matos *et al.*, 1994).

The inescapable conclusion from all these studies is that in developed countries such as the United Kingdom there has been little progress in the reduction of inequalities in health between the different socioeconomic groups in the last 50 years (Whitehead, 1987; Townsend *et al.*, 1986; Marmot & McDowell, 1986; Smith & Jacobson, 1989; Acheson, 1990; Marmot *et al.*, 1991). In this context it is perhaps useful to remember that the income of chief executive officers of the major American companies was 29 times greater than that of the

average manufacturing worker in 1980, and 93 times greater 10 years later (Galbraith, 1992).

There is little wonder that inequalities in health have been found in every country in which they have been sought and in which adequate information is available. The relationships between socioeconomic conditions and health have in recent years been the object of more studies in the United Kingdom than anywhere else, but results reflecting similar contrasts have also been obtained in the United States, Denmark, France, Italy, Argentina and Australia (Susser *et al.*, 1985; Clemmesen & Nielsen, 1951; Matos, 1994; Desplanques, 1984, 1991; McMichael, 1985; Wilkins *et al.*, 1990; Williams *et al.*, 1991; Terris, 1990; Costa *et al.*, 1994; Iscovich, 1989). In several studies the importance of differences in educational level has been stressed. Lower educational-level groups have higher death rates, which can to a large extent be explained by a higher prevalence of risk factors related to working conditions, material living conditions, lifestyles and ways to cope with stress (a spectrum that should be extended to include cultural factors) (Kunst & Mackenbach, 1994). From a study in Italy, it appears that in the 1980s there would have been 40 000 deaths fewer per year if people without a university education had had the same mortality as people with a university degree (Costa *et al.*, 1994). Inequalities in education seem therefore to be an indicator of social and health inequalities that is as or more important than differences in occupations (Bouchardy *et al.* 1993; Vineis & Capri, 1994).

In the last 50 years, lung cancer mortality has continued to increase in the lower socioeconomic groups but has started to decrease in the socioeconomically more favoured groups. The usual explanation is that within the lower socioeconomic groups, smoking (as well as drinking and other unhealthy behaviours) is more and more frequent than among the favoured groups, where smoking was more frequent in earlier times. Differences in smoking, however, cannot entirely explain the difference in mortality among the socioeconomic groups, as lung cancer is more frequent in lower socioeconomic groups even among non-smokers (Smith *et al.*, 1991). The mortality from gastric cancer is decreasing in all groups, but the gap between the more and the less favoured socioeconomic groups not only has not been reduced but has slightly widened (Desplanques, 1991) in a way similar to what is observed for mortality of Black and White infants (Schoendorf *et al.*, 1992), stressing once more that the factors affecting overall mortality may be different from those at the origin of the class disparities. In order to decrease such disparities, prevention should be concerned not only with the universal availability and delivery of services, but also with sociocultural differences in which disparities may be deeply rooted.

An element that can certainly influence mortality, at least at some cancer sites, is access to early diagnosis and to adequate therapy. In the study of Kogevinas (1990) this was seen in the higher mortality for endometrial cancer in the less favoured socioeconomic groups. Cancer patients of more favoured socioeconomic groups treated in private clinics were shown to survive their disease better than patients of less favoured socioeconomic groups treated in public hospitals (Linden, 1969). This differential in survival between socioeconomic groups has been further confirmed for cancers of relatively good prognosis, for which the duration of survival could be expected to depend partially on the timing and quality of treatment (Vineis & Capri, 1994; Kogevinas *et al.*, 1991).

Cancer in developing countries

There is a striking relationship between per capita GNP and life expectancy. The world maps of the distribution of GNP and of life expectancy provide impressive evidence of their direct relationship, to the point that the maps could be easily mistaken for each other (The World Bank Atlas, 1990; The Commission on Health Research for Development, 1990). The disparity in wealth between the nations is such that an average individual in a less developed country earns 50 times less (in certain countries hundreds of times less) than an average individual in an industrialized country (The World Bank Atlas, 1990).

It is useful to mention the origin of the term 'developing countries' and the particular meaning it conveys. The term, which apparently derives from the view expressed by the USA President Harry Truman in 1949 that most areas of the world were underdeveloped, reflects entirely a Western concept of development. This implies that 'developing' countries will necessarily have to go through the same phases of development that Western countries have experienced during the industrial revolution,

only at a delayed pace (Pearce *et al.*, 1994). The incapacity, or unwillingness, of the Western world to conceive a development that may follow other paths and pursue goals other than those of the industrialized countries may be seen as almost equivalent to the perpetuation of neocolonialism, which grants an apparent political independence but also guarantees a very tenacious economic dependence.

Occupational risks in developing countries are becoming a very serious problem (Kogevinas *et al.*, 1994; Rantanen *et al.*, 1994) largely as the consequence of the transferring of hazardous industries from highly industrialized countries, where certain industries are now judged unacceptable because of the risks for health and the environment, to poor countries, where adequate legislation protecting the workers and the environment does not yet exist (Simonato, 1986; La Dou, 1992; Jeyaratnam, 1994). The problem is further exacerbated by the little time given for the adjustment and training of the workers for new technologies (Kogevinas *et al.*, 1994). A pertinent example is the so-called 'maquiladora factories' located near the border of Mexico and the USA. In 1970, there were 16 such assembly plants; in 1991 the number had climbed to probably over 1 900 (25% of them located in Tijuana and 18% in Juarez), employing about 500 000 people at a salary that is much lower than in the USA and also lower than Mexican industry pays in the interior of the country (Moure-Eraso *et al.*, 1994). Acute health effects are reported to be common, but given the high labour turnover rates and the lack of health care structures, it will be extremely difficult to survey the long-term health effects. For instance, gross exposure to asbestos of workers, as well as the neighbouring population, in an asbestos textile plant has been reported (Abrams, 1979).

The differences in ranking of cancer sites between the industrialized and developing countries are similar to those seen between different socioeconomic groups within industrialized countries. Cancers of the stomach, cervix uteri, liver and oesophagus are most common both in developing countries and in the less favoured socioeconomic groups in industrialized countries (Parkin *et al.*, 1993). However, there is a notable discrepancy in interclass differences between the industrialized and the developing countries. In the developing countries, lung cancer mortality is highest in the socioeconomically more privileged groups, even though the rates remain considerably lower than those seen in industrialized countries (Cuello *et al.*, 1982). This can be explained by the fact that as cigarettes are expensive, only the well-to-do people in developing countries have been able to afford them and they have smoked more than the poor. It is relevant to note the different rates of growth in tobacco consumption in industrialized and developing countries, with the former showing decreases and the latter high rates of growth, providing good evidence for the success of the tobacco multinationals' efforts to open new profitable markets. Immediate and effective measures to prevent the massive introduction of the habit of smoking tobacco in developing countries, where the habit does not exist or where it has only recently been introduced, could avoid an epidemic of major proportions of lung cancer and other tobacco-related cancers and diseases. However, like the double standard with regard to occupational risks, there is a quite different attitude toward tobacco publicity and sales in the industrialized and developing countries. The concern for the damage to health that tobacco causes appears to have some difficulty crossing the borders of rich countries, which do not seem to be concerned if their tobacco corporations promote tobacco sales in the poor countries. The attributable fraction of cancers at certain sites (namely lung, oral cavity, oesophagus, pancreas, larynx and bladder) is directly related to the frequency of the smoking habit and therefore higher in African regions where the habit was introduced earlier – that is South Africa and several northern African countries (Sasco *et al.*, 1994). Pertinent action now could still prevent future epidemics of tobacco-related diseases in a large part of Africa (Chapman *et al.*, 1994; Peto, 1994).

Another inverse trend between industrialized and developing countries is seen in the use of certain hazardous chemicals: over 50 million pounds of pesticides that are either banned from use or unregistered or restricted in the USA (such as chlordane, mirex, dicofol, ziram and dibromochloropropane) were still shipped in 1990 from the USA, mainly to developing countries and in particular those in Latin America and Africa (Smith & Beckmann, 1991; Boffetta *et al.*, 1994).

A further example of the ambiguity that governs the relationships between industrialized and

developing countries concerns the attitude towards environmental protection. There is little doubt that industrialized countries have contributed enormously more than developing countries to the downgrading of the world environment. Still now a significant proportion of the environmental pollution that occurs in developing countries is due to the exploitation of resources by multinational corporations. Industrialized countries now intend to impose their new environmental standards to poor countries, which may see this imposition as a continuation of the politics of colonial domination. They could not afford such standards economically and technically without substantial help. The pretension of the rich countries that, when convenient, there is one and the same law for the rich and the poor, closely resembles a virtuous hypocrisy (Anonymous, 1993).

Countries in central and eastern Europe that were part of the Soviet empire, Russia included, are experiencing health problems to a large extent similar to those of the developing countries. The conditions are obviously not the same – the competence and technological know-how of central and eastern Europe is rather more similar to those of Western countries than developing countries. Nevertheless, hazardous industrial productions are in operation and it is not evident that they will rapidly be modified or shut down. Occupational risks are therefore high and extensive pollution creates problems not only for the occupationally exposed workers but also for the general population (Pereira *et al.*, 1992). Life expectancy is not increasing as it is in other European countries and adult male mortality rates are much higher than in the rest of Europe. Age-standardized male mortality rates have continued to decline in western Europe, but they rose since 1960 between 2% and 13% in countries of central and eastern Europe. In the age group 45–49 years, mortality rates in males increased between 1965 and 1989 by 7% in East Germany and by 131% in Hungary (Feachem, 1994). A considerable part of the increase seems to be attributable to a steep increase of ischaemic heart disease. In addition to having hazardous industries, unbalanced diets and inadequate health care structures, central and eastern European countries, like developing countries, are faced with the attempt of tobacco multinationals to conquer their markets with all sorts of incentives and publicity.

The increasing burden of cancer

Projections of cancer incidence in future years indicate that the number of cancer cases is almost certain to increase everywhere in the world. Figures 1–3 show projections of the total number of cancer cases in the year 2010 in North and South America, Europe, Africa and Asia. The expected increases in the number of cancer cases are 27% in Europe, 116% in Africa, 44% in North America, 101% in South America, 92% in all of Asia and 68% in Japan. Part of this increase, proportionally much more conspicuous in developing countries, can be attributed to demographic changes (the aging of the population); the rest is a real increase (Parkin *et al.*, 1993). In as much as available health structures are insufficient to cope with the present demand, it is difficult not to worry about the disastrous situation we may run into in the near future.

As the absolute number of cases will almost inevitably increase over the next decades, the cost of cancer therapy becomes an even more relevant concern. It has been estimated that the average cost per patient of cancer treatments within the European Union was, in 1991, 3000 ECU (1 ECU = about 1.3 US$) for conventional radiotherapy, 7 000 ECU for surgery, 12 000 ECU for chemotherapy, and at least 40 000 ECU for bone marrow transplantation. It is highly unlikely that developing countries, but perhaps also countries of central and eastern Europe, will be in a position to provide adequate treatment for most of their cancer patients, as even the richest countries are already unable to guarantee it. This is perhaps the most powerful argument in support of primary prevention of cancer.

Primary prevention will not be a panacea for all evils, but it is an inescapable conclusion that only a decrease in the incidence of chronic degenerative diseases, and/or a considerable delay in their manifestation, would avoid a further increase in the costs of health.

In addition, unless any extraordinary breakthrough in therapy is made soon, the rates of success of therapy will remain low for cancers that are inoperable and/or which show diffuse metastases at the time of diagnosis. The situation in this respect is already critical in developing countries, where the average survival time for cancer patients from the time of diagnosis is on average less than a third of that in industrialized countries.

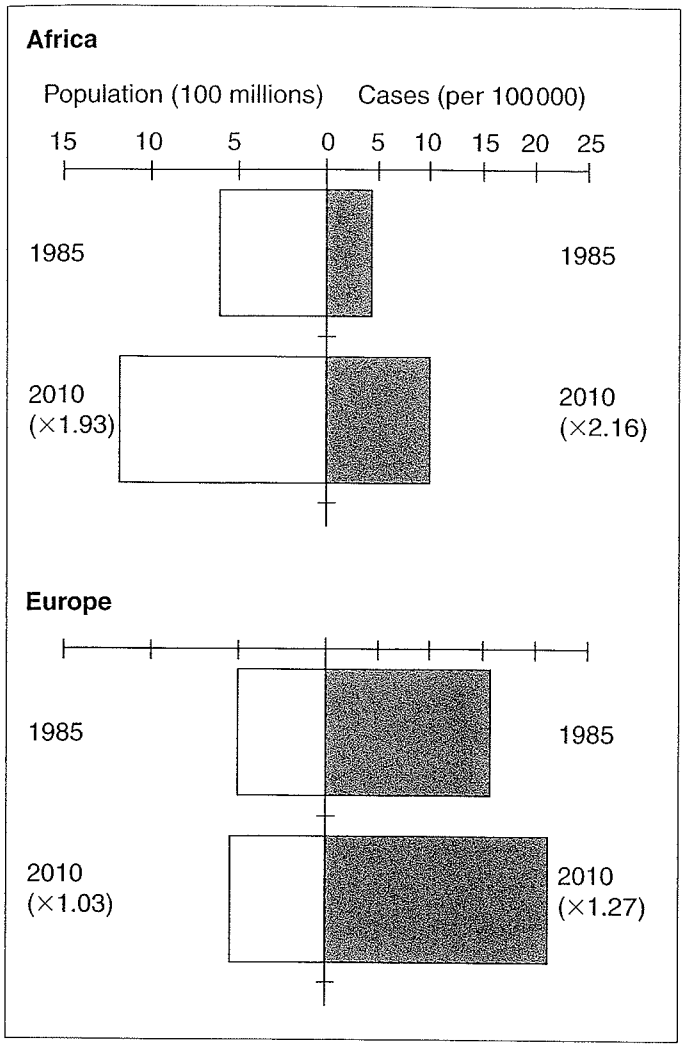

Figure 1. Cancer projections 1985–2010 for Africa and Europe based on synthetic age-specific incidence (assuming that there will be no change in age-specific incidence rates over time).

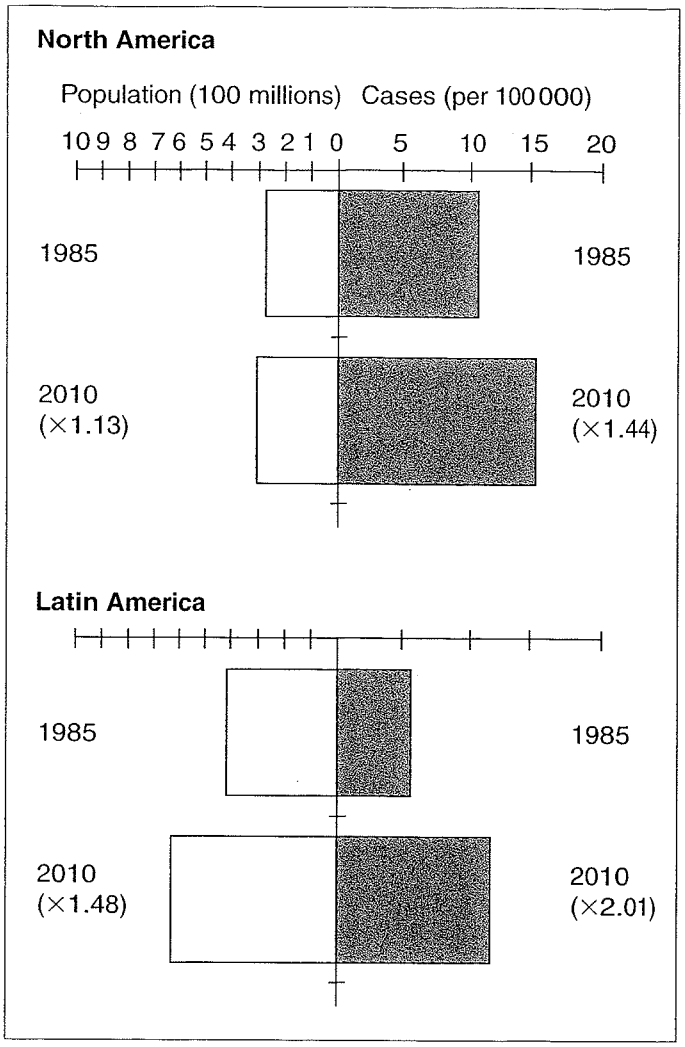

Figure 2. Cancer projections 1985–2010 for North America and Latin America based on synthetic age-specific incidence (assuming that there will be no change in age-specific incidence rates over time).

Projections of cancer costs, even with the caution with which projections of this type must be taken, show an upward trend. In 1988, the Netherlands spent 1 894 million Dutch Guilders (MDF) on the care of cancer patients, of which 61%, or 1 146 MDF, were spent on patient hospital care. The projected costs for the year 2005 and 2020 are 2 312 and 2 778 MDF, respectively – a 18% and 31% increase over those of 1988 (Koopmanshap *et al.*, 1994).

Medical consumption and relative costs show two peaks during the course of cancer, namely during the first year following diagnosis and in the last year of life. The question is often raised whether health care costs can be substantially reduced by reducing the cost of care of terminal patients. Measures taken with the intent of reducing unnecessary medical services, and among these are rarely included expenditures for the care of patients known in advance to be dying, have resulted in a reduction of both efficient and wasteful services (Emanuel & Emanuel, 1994). It is not at all clear, therefore, that ethics and economics can be reasonably linked to reduce what can be only very imprecisely defined as 'futile care', and that such reduction would in any case be substantial.

Therefore, if governments have to find a way to reduce the cost of health, other measures must be sought. Within countries of the OECD (Organization for Economic Cooperation and Development), government spending to maintain the welfare system (pensions are first in the ranking of expenditures, and health comes second) has almost doubled between 1960 and 1990, passing from 28.1% to 43.8% of the GNP. Of the underlying pressures

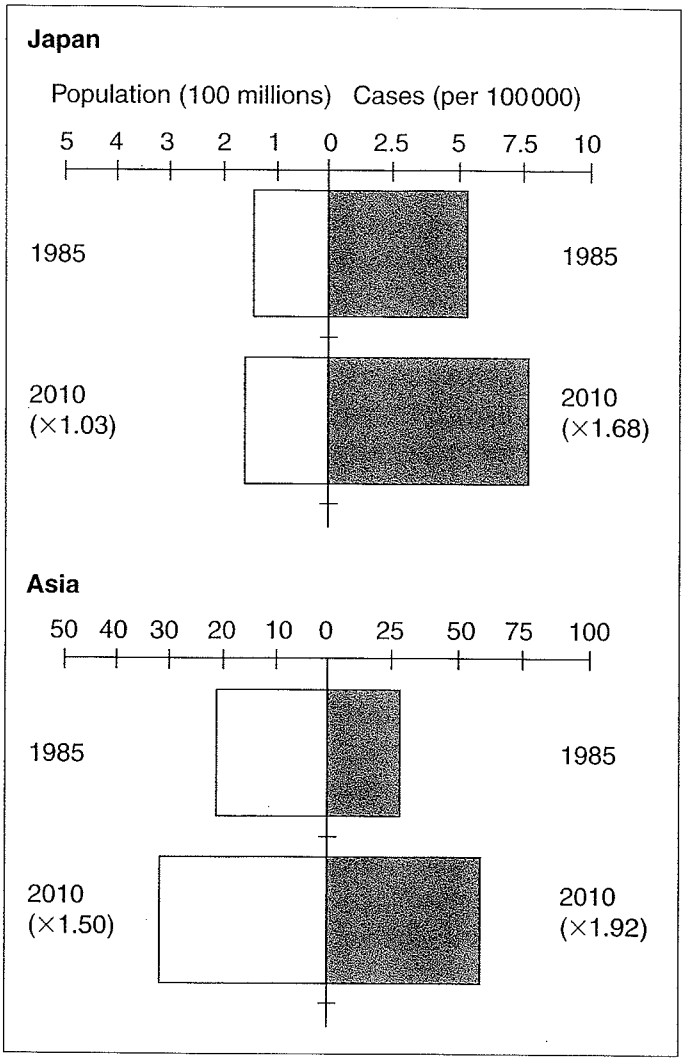

Figure 3. Cancer projections 1985–2010 for Japan and Asia based on synthetic age-specific incidence (assuming that there will be no change in age-specific incidence rates over time).

on welfare spending, the most important is the aging of the population. The number of people over 65 years of age in the OECD countries has grown from 61 million in 1960 to 100 million in 1990 and is expected to increase further in the next decades (Willman, 1994). Increased longevity may not necessarily mean an increase in medical care expenses if there is a decrease in the incidence of chronic diseases in middle- aged individuals. However, the development of new diagnostic and therapeutic devices could increase expenses, as the demand for them will grow even if they are shown not to be cost-effective.

It is rather encouraging, however, that several poor countries have been able to improve their educational and health systems more and faster than their economies. One reason for this is probably that health services and educational expansion are both labour intensive and therefore relatively inexpensive in poor economies (Sen, 1994), but the most important reason is the genuine will to improve health and educational services. Such will has been shown more clearly by several developing countries than by most industrialized countries.

The rich and the poor have different health histories

It is unrealistic at present to try to give a molecular explanation for the differences in incidence and mortality for most cancers between more and less favoured socioeconomic classes. Understanding of the multistage progression towards the clinical manifestation of malignancy has evolved a great deal since its earliest description (Berenblum & Shubik, 1949; Foulds, 1969), but it is likely that many more genetic and epigenetic alterations than have been identified so far are required to complete the process of carcinogenesis (Loeb, 1991, 1994). Thus we cannot yet have a complete and satisfactory translation into molecular terms of the effect(s) of environmental exposures than can be demonstrated epidemiologically, although recent results have already permitted a certain proportion of cancer cases to be attributed to specific environmental factors (Jones *et al.*, 1991; Hollstein *et al.*, 1993; Harris, 1994; Greenblatt *et al.*, 1994). Every individual's 'health history' is characterized by life-long influences and superimposed short-term factors, but health biographies of the rich and the poor show divergences that are the result of the cumulation and interaction of a series of events, some of which can already be identified (others seem likely to become identifiable in the near future), and are qualitatively and quantitatively different. Schematically, this could, for instance, mean that certain individuals and certain segments of the population are exposed more frequently and to more hazardous agents than others and/or less frequently to protective agents.

How far one has to go back into a person's history to trace the beginning of the long development of most cancers we do not know precisely, but it is already clear that events that take place early in life, perinatally and even before conception, may contribute to an increased risk of cancer later in life (Tomatis *et al.*, 1992). In this context, it is relevant to note that the strongest correlation between exposure of parents before conception and

an increased cancer risk in the progeny has been reported in relation to exposure to occupational carcinogens and radiations (Tomatis, 1994).

Conclusions

Sanitary conditions are worse, mortality higher, survival rates of cancer patients lower, and life expectancy shorter in developing countries than in industrialized countries. Similar if not identical differences can be seen within industrialized countries between the socioeconomically less and more favoured population groups. Until some years ago, one could have perhaps corrected the above sentence by saying 'can *still* be seen', but in the present economic situation and with the present low priority given to social interventions, it would rather appear that such differences not only will not be reduced but also will affect an increasing proportion of the population within many industrialized countries. The growing phenomenon of lack or loss of employment is also directly related to a worsening of life expectancy. Losing a job may result in a doubling of the risk of death. In many areas of the industrialized world social and environmental conditions comparable with those existing in the poorest countries last century have been recreated (Drucker, 1993). This can be seen as the result of the progressive establishment and consolidation of a 'two-thirds society' as predicted in 1985 (Glotz, 1987). In a two-thirds society, the marginalization and social degradation of the weakest third of the society is accepted and programmed, while selfishness and individualism are encouraged and rewarded. The weakest third of the society, which has characteristics of the 'functional underclass' described by Galbraith (1992), is composed of the unemployed (that is, those who have lost and those who have not found employment), the unqualified or semiskilled labourers, the migrant workers, the handicapped, the less gifted and the young who cannot find their place in the professional system.

The projections of the total number of cancer cases in the next decades indicate a generalized increase, proportionally greater in developing than in industrialized countries. Given the inadequacy of the currently available sanitary structures and of the preventive measures that may reduce the anticipated increase, a potentially disastrous situation has to be feared.

Progress in science has had a negligible effect on improving the usual behaviour of people. Today's world provides a clear indication that the trend is towards increasing selfishness of the rich countries – that is, those in which science is better developed. It almost appears as if the progress of science has committed us to rigid obedience to an economic system that is prone to condemn the weakest portion of the world's population to starvation and poor health – a sort of aberrant neocolonialism. As Bertrand Russell said 'science enables the holders of power to realize their purposes more fully than they would otherwise do', but 'science is no substitute for virtue' (Russell, 1924). Even if the proportion of the GNP spent for health worldwide had been slightly increased in recent years, it would still have remained smaller than the proportion spent for defence. It cannot be ignored that almost one trillion dollars were spent in 1988 worldwide for military purposes (Sivard, 1991). Although there has been a tendency to reduce the production of arms for export and some reduction in military expenditures has been announced and has probably taken place, it is not clear that a real inverse, and hopefully irreversible, trend in military expenditures has been initiated (Barnet, 1991).

Most countries and governments justify the severe limitations of health resources by maintaining that there is an apparent infinity of demands that could in any case never be satisfied. Such a claimed infinity of demands is in fact surely in large part the result of an accumulation of unsatisfied demand over a long period. One can ask whether health resources are unavoidably and irremediably scarce, or whether such scarcity is a political choice. In our society, the imperative of profitability conditions even dominates research priorities and the resulting medical care system, of which prevention today represents a minimal part. Whether one day we shall be able to reverse the present trend so as to achieve a more equal distribution of resources and an orientation of research toward prevention as a main goal remains to be seen, but much will depend on our commitment as scientists and citizens of this world. In today's society, we could at least demand, as a first step, that health measures and intervention of undoubted efficacy not be rationed (Frankel, 1991). We should then also press for acceptance of the principles that a basic and irreplaceable element of public health policy is the improvement of living standards, that much im-

provement is within the reach of government policy (Wilkinson, 1986; Terris, 1990), and that a real and stable improvement in the health of populations depends on, and can only occur through the reduction of inequalities (Bartley, 1994) and the respect of human rights (Mann *et al.*, 1994; Susser, 1993; Leary, 1994).

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