Editorial

Poverty and Cancer¹

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Social and Health Inequalities

Many attempts have been made to reduce poverty and to arrive at a more egalitarian society. But in spite of social and philosophical theories underlying such attempts and the undoubted progress made in many countries, social inequalities remain with us and seem to be increasing. Inequalities in health are just part of the social inequalities which characterize our society and are among their most convincing indices (1). The identification of causes and mechanisms behind the origin and persistence of poverty in our society has perhaps been a victory for sociologists and philosophers but has not led to a comparable victory for the prevention of social disparities around the world (2). Similarly, the identification of the causes of a considerable proportion of human cancers, including tobacco, industrial chemicals, and radiation (3), has been a great achievement by laboratory scientists and epidemiologists but up to now has been followed by only limited victories for prevention. The incapacity of our society to eliminate poverty is probably one of the most blatant examples of failure in prevention. As we have also been only partially successful in the prevention of cancer, overcoming the combined problem of poverty and cancer seems likely to be particularly difficult.

Several levels of inquiry about poverty and cancer are possible: (a) exploring socioeconomic differences within the industrialized countries and poverty in the midst of wealth; (b) comparing industrialized (rich) countries with developing (poor) countries; (c) comparing poverty within rich countries with poverty in the developing countries. As regards the last of these issues, probably one of the major resemblances between the industrialized and developing countries is that everywhere a gulf separates the poor from the rich, although this gulf is very considerably wider in developing countries.

Poverty may be interpreted as a relative concept; a poor person in a rich country might be seen as relatively rich in a poor country, depending on the criteria adopted to measure poverty. Similarly, it may appear that to be poor in a poor country is more “normal,” with a better integration into the society, than to be poor in a rich country, and therefore that it entails less unhappiness and misery. This of course tends to be the opinion of those who write or talk about misery without being poor. Very rarely, if ever, are enquiries made by a representative of the poor, in the same way as history is generally interpreted and written by the winners and very rarely by the losers.

While health expenditures represent a small fraction of the GNP³ in developing countries, they account for a considerable and increasing proportion of the GNP in industrialized countries (4–9). This does not seem, however, to result in proportionate gains in public health. One of the main reasons for the lack of correspondence between increases in expenditures and increase in well-being is probably that usually no more than 2–3% of the budget for health is earmarked for prevention; another is that it is generally the segment of the population that most needs it that has the least access to health care. A third, and perhaps the main, reason is that investment in health has been seen too often in terms similar to those of other sectors of the economy and has thus been conditioned by the same imperatives of profit that drive industries or private enterprises. As the “profit” produced by health services is not easily quantifiable, all expenditures in public health are seen as having a low priority.

In a country like the United States, for instance, which spends about 12% of its GNP on health, there are around 35 million people [between 34 and 37 million according to a recent estimate (10)] who are not covered by health insurance and who therefore have no access to a health protection system.

In discussing poverty, one enters a territory in which the borders between health, social sciences, and politics are rather indistinct. Sigerist (11) 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.” He also stated earlier that “poverty is the chief cause of disease” (12). The latter statement, which appears to be in line with the sociological theory of epidemics that was supported last century by many first-class scientists such as Virchow (13), may contain a certain degree of exaggeration, but no one can deny that the chances of survival and remaining in good health are greater if you are rich than if you are not. In a slightly more shaded and more acceptable statement, McKeown proposed that “poverty is not a direct cause of disease, but it is the main determinant of influences that lead to disease” (14).

It is also unavoidable that in discussing poverty and cancer, one has also to look at poverty in relation to overall mortality and to diseases other than cancer. When one reviews the literature, it is rather depressing to encounter the same observations, the same results, and the

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³ The abbreviations used are: GNP, gross national product; ECU, European currency unit.
same conclusions and recommendations repeated over the years. Although there is not much to be found that is new, poverty continues to be rediscovered. While several attempts to improve public health were already being made in some countries at the time of the Renaissance (15, 16), the first official recognition of the necessity to intervene in favor of the poor in general, and of the working class in particular, was made in the last century (Select Committee on the Health of Towns, 1840; quoted in Ref. 17). Disease and destitution may have been considered part of the inscrutable plan of the Almighty, but when by injuring and killing the workers they 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 should be taken, since they were "necessary not less for the welfare of the poor than the safety of property and the security of the rich." This was followed in 1842 by the famous Chadwick Report (17). Edwin Chadwick, a lawyer by education and a disciple of Jeremy Bentham, 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. Largely due to his initiative and perseverance, the report universally known as the Chadwick Report on the "Sanitary Condition of the Labouring Population of Great Britain" was published in 1842. This report marks the beginning and forms the basis of the wave of sanitary reforms initiated toward the middle of the last century (18).

General and Infant Mortality
In 1828, the French physician Villermé recorded the sharp contrast 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 (19, 20). Benoist de Châteauneuf, a friend and contemporary of Villermé, provided unassailable evidence that differences in age-specific mortality increased with age, with practically none of the poor reaching old age (20, 21). About 10 years later, similar differences in mortality among people living in rich and poor residential areas were observed in the United Kingdom (22, 23).

In the twentieth century, UK mortality rates for tuberculosis, ischemic heart disease, bronchitis, and stomach and other cancers in 1930–1932 were higher among the less-favored Classes IV and V than among the more-favored Classes I and II (24). Twenty years later the same gap existed (25–27) (Table 1) (28). Infant mortality in the United Kingdom had fallen since 1921, but the social gradient indicating a higher mortality within Classes IV and V remained unchanged for the following 50 years. The ad hoc working group on Inequalities in Health that the UK Labour government set up in 1977 confirmed that while overall death rates had continued to fall, the difference between the classes remained proportionately the same or had even widened. The report of the group (known as the Black Report, from the name of its chairman) was never published, since at the time it should have gone to press, in 1981, the Labour government had been replaced by a Conservative government. A limited number of duplicate copies were instead distributed during a bank holiday in August of that year. The new government claimed that the pursuit of equality in health would hinder much-needed economic growth and that greater inequality, by permitting faster growth, would give more real benefit to the less favored than a policy of equal shares for all (23). 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.

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 fell from 38.4 to 26.4 (27). It might be inferred that an actual reduction of inequal-

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**Table 1** Mortality by social class, 1931–1981 (men, 15–64 years, England and Wales). Figures are standardized mortality ratios, which express age-adjusted mortality rates as a percentage of the national average at each date.

<table>
<thead>
<tr>
<th>Class</th>
<th>1931</th>
<th>1951</th>
<th>1961*</th>
<th>1971*</th>
<th>1981*</th>
</tr>
</thead>
<tbody>
<tr>
<td>I Professional</td>
<td>90</td>
<td>86</td>
<td>76 (75)</td>
<td>77 (75)</td>
<td>66</td>
</tr>
<tr>
<td>II Managerial</td>
<td>94</td>
<td>92</td>
<td>81</td>
<td>81</td>
<td>76</td>
</tr>
<tr>
<td>III Skilled manual and nonmanual</td>
<td>97</td>
<td>101</td>
<td>100</td>
<td>104</td>
<td>103</td>
</tr>
<tr>
<td>IV Semiskilled</td>
<td>102</td>
<td>104</td>
<td>103</td>
<td>114</td>
<td>116</td>
</tr>
<tr>
<td>V Unskilled</td>
<td>111</td>
<td>118</td>
<td>143 (127)</td>
<td>137 (121)</td>
<td>166</td>
</tr>
</tbody>
</table>

* To facilitate comparisons, figures shown in parentheses have been adjusted to the classification of occupations used in 1951.

* Men, 20–64 years, Great Britain.


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**Fig. 1.** Standardized mortality ratios (SMR) for select causes of death in Britain, 1970–72 and 1979–83, for manual (M) and nonmanual (N) workers. For each cause the standardized mortality ratio in 1979–1983 is 100 for each sex. Reproduced with permission from Ref. 32.
ties had occurred, 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 was growing still greater, in spite of and in parallel to the changes in the overall size of the two classes. The persistence and even the 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 (29).

Marxist theory, which was seen as forming the background to the Black Report, was heavily criticized for being reductionist, since it gave overriding importance to economic circumstances and by doing so underestimated 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 (described as the "middle mass"), whose members are employed and 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 unemployed or low-waged, lives in rented accommodations, and is highly dependent on public services. This division between a more affluent working population and the less advantaged underclass seemed more significant than the conventional Marxist division between manual and nonmanual occupations (Pahl 1984; quoted in Ref. 23). 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 nonmanual employment has lost much of its original significance.

Marxist-inspired theories have also been accused of ignoring biology, in particular a possible genetic explanation for the persistence of differences in class-related mortality. While there was 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, which strongly suggests that no single factor could account for the associations seen and for the alleged increased general susceptibility to disease (1, 30).

Inequalities in Health in Industrialized Countries

The inescapable conclusion 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 (Fig. 1) (31-36). The difference in infant mortality between the more and the less favored socioeconomic groups persists, and the divergence in mortality in adults from various causes is becoming wider, if anything (30). Nevertheless, there has been a dramatic improvement in infant survival rates among all groups. It may be argued that by promoting the decrease in childhood mortality, the ruling class aimed, during the early phases of industrialization, at guaranteeing the safety of its own children as well as of those of the other social classes and at
ensuring the existence of a sizable young working class without being able and willing, however, to guarantee its adequate welfare or long-term survival. One could perhaps see a similar situation being perpetuated in more recent times by the attitude of industrialized countries toward developing countries.

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 been obtained in, for example, the United States, Denmark, France, Italy, and Australia (1, 5, 37-43). Although U.S. scientists have long since recognized that blacks and other minorities in the United States are disadvantaged in having a socioeconomic and health experience that is comparatively more severe compared with that of whites (2, 44-49), a sort of official recognition that poverty may be a more powerful determinant factor of cancer risk than race seems to have occurred only very recently (10).

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 favored groups. The usual explanation is that within the lower socioeconomic groups, smoking (as well as drinking and other unhealthy behaviors) is more frequent. Although this is partially true, differences in smoking cannot entirely explain the difference in mortality among the socioeconomic groups, since lung cancer is more frequent in less favored socioeconomic groups even among nonsmokers (30). The mortality from gastric cancer is decreasing in all groups, but the gap between the more and the less favored socioeconomic groups has not been reduced; in fact, it has instead slightly widened (50) (Figs. 2 and 3).

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 Neilsen (37) to the more recent study of Kogevinas (51), it appears that the sites where the differences are the highest are the stomach, lung, and cervix uteri (Figs. 4, 5, and 6). 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 esophagus, while in one of the studies higher rates were reported also for the bladder, rectum, and pancreas (30).

Another element that can certainly influence mortality, at least for some cancer sites, is access to early diagnosis and to adequate therapy. In the study of Kogevinas (51) this was seen in the higher mortality for endometrial cancer in the less favored socioeconomic groups. Cancer patients of more favored socioeconomic
groups treated in private clinics were shown to survive their disease better than patients of less favored socioeconomic groups treated in public hospitals (52). This differential in survival between socioeconomic groups has been further confirmed for cancers of relatively good prognosis, for which the duration of survival could reasonably be expected to partially depend on the timing and quality of treatment (53).

The differences observed between the socioeconomic groups within industrialized countries resemble, but are not identical to, those that can be observed between industrialized and developing countries. First of all, the incidence of cancer, and the mortality rates, are still much higher in industrialized (rich) countries than in developing (poor) countries, so that the total annual number of new cancers in the world is almost equally distributed between the developing and the industrialized countries, although the latter represent only one-third or less of the world population (54). Second, the most frequent target sites do not everywhere coincide. For instance, lung cancer ranks first in frequency in industrialized countries but only sixth in developing countries, while cervical cancer ranks first in developing countries and ninth in industrialized countries (54). There are, however, some similarities that could help us to predict what may happen in developing countries in the near future.

**Cancer in Developing Countries**

What is immediately striking when one discusses poverty is the direct 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; in fact the maps could easily be mistaken for each other (55, 56). The disparity in wealth between the nations is such that an average individual in a less developed country earns 50 times less (in some countries hundreds of times less) than an average individual in an industrialized country (55) (Table 2).

The differences in ranking of cancer sites between the industrialized and developing countries, shown by Parkin et al. (54), are similar to those seen between different socioeconomic groups within industrialized countries. Cancers of the stomach, cervix uteri, liver, and esophagus are the most common both in developing countries and in the less favored socioeconomic groups in industrialized countries. There is, however, a notable

![Fig. 7. Age-adjusted death rate for cancer of the stomach (+) and lung (○). Reproduced with permission from Ref. 60.](image-url)
discrepancy in interclass differences between the industrialized and 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 (57). This can be explained by the fact that since cigarettes are expensive, only the well-to-do people in developing countries can afford them and they smoke more than do the poor. In this context, 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.

Another inverse trend between industrialized and developing countries is seen in the use of certain hazardous chemicals: over 50 million pounds of pesticides which are either banned from use or unregistered or restricted in the United States (such as Chlordane, Mirex, Dicofol, Ziram, and dibromochloropropane) were still shipped in 1990 from the United States, mainly to developing countries (59). This can be explained by the case of Japan. Thus, gastric and lung cancer mortality rates can be attributed to demographic changes (i.e., the aging of the population), the rest being a real increase. Inasmuch 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.

Since the absolute number of cancer cases will almost inevitably increase over the next decades, the cost of cancer therapy becomes an even more relevant element of concern. It has been estimated that the average cost per patient of cancer treatments within the European Community is 3,000 ECU (1 ECU = about U.S. $1.3) for conventional radiotherapy, 7,000 ECU for surgery, 12,000 ECU for chemotherapy, and up to 40,000 ECU for bone marrow transplantation. Even if these costs, representing estimated averages, could possibly be reduced, it is highly unlikely that developing countries will be in a position to provide adequate treatment for most of their cancer patients, since even the richest countries are already unable to guarantee it. This is perhaps the most powerful argument in support of primary prevention of cancer.

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

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**Table 2** Gross national product per capita, 1980-1989

<table>
<thead>
<tr>
<th>GNP per capita growth rate 1980-1989 (%)</th>
<th>Number of countries</th>
<th>GNP 1989 (U.S. $000,000)</th>
<th>Population 1989 (000,000)</th>
<th>GNP per capita 1989 (US $)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 0</td>
<td>64</td>
<td>899,000</td>
<td>820</td>
<td>1,100</td>
</tr>
<tr>
<td>0-0.9</td>
<td>16</td>
<td>654,000</td>
<td>393</td>
<td>1,660</td>
</tr>
<tr>
<td>1.0-1.9</td>
<td>21</td>
<td>2,209,000</td>
<td>244</td>
<td>9,050</td>
</tr>
<tr>
<td>2.0-2.9</td>
<td>16</td>
<td>9,575,000</td>
<td>673</td>
<td>14,230</td>
</tr>
<tr>
<td>3.0 or more</td>
<td>29</td>
<td>4,364,000</td>
<td>2,441</td>
<td>1,800</td>
</tr>
<tr>
<td>No data</td>
<td>39</td>
<td></td>
<td></td>
<td>626</td>
</tr>
</tbody>
</table>

Source: Ref. 55.

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*Fig. 8.* Cancer projections, 1980-2000, 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).*
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 increasing the risk of cancer later in life. 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 (for a review see Ref. 66).

Conclusion
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 still be seen within industrialized countries between the socioeconomically less and more favored population groups. The projections of the total number of cancer cases in the next decade indicate a much more conspicuous proportional increase in the developing than in the 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 behavior of people. Today’s world provides clear indications that the trend is toward increasing selfishness of the rich countries, i.e., those in which science is better developed. It almost appears as if the progress of science had 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 could otherwise do,” but “Science is no substitute for virtue” (67). Even if the proportion of the GNP spent for health worldwide was slightly increased in recent years, it still remains smaller than the proportion spent for defense. It cannot be ignored that almost $1 trillion were spent worldwide for military purposes in 1988 (68), and there is no clear evidence that, at least for the United States, an inverse trend in military expenditures has been initiated (69).

Most countries and governments justify the severe limitation of health resources by maintaining that there is an apparent infinity of demand that could in any case never be satisfied. Such a claimed infinity of demand is in fact simply 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 or 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. In today’s society, however, we could at least require that health measures and interventions of undoubtedly efficacy not be rationed (70). We should also press for acceptance of

**Different Health Biographies of the Rich and the Poor**

It is unrealistic at present to try to give a molecular explanation for the differences in incidence and mortality for most cancers between more or less favored socioeconomic classes. The understanding of the multistage progression toward the clinical manifestation of malignancy has evolved a great deal since its earliest description (61, 62), but it is likely that many more mutations and genetic alterations than have been identified so far are required to complete the process of carcinogenesis (63). Thus the translation into molecular terms of the effect(s) of environmental exposures that can be demonstrated epidemiologically appears rather remote today. However, although every individual’s “health biography” is characterized by life-long influences and superimposed short-term factors, health biographies of the rich and the poor show divergences that are the result of the cumulation and interaction of a series of events, part of which can already be identified (others seem likely to become identifiable in the near future), and that 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. The memory of our cells is only now being explored at a level that may some day enable us to trace back events that happened years or decades earlier (63–65). If and when the cellular memory can be probed to reveal social inequalities remains to be seen, but it is likely that we shall be better able to fool our fellow humans and population groups than our own cells.

**Fig. 9.** Cancer projections, 1975–2000, for Africa and Europe based on synthetic age-specific incidence (assuming that there will be no change in age-specific incidence rates over time).
the principle that a basic and irreplaceable element of public health policy is the improvement of living standards and that much improvement is within the reach of government policy (29, 43).

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References

31. Townsend, P., Phillimore, P., and Beattie, A. Inequalities in Health in the Northern Region. Bristol, England: University of Bristol and Northern Region Health Authority, 1986.


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