heavy advance publicity in the press and on radio and television. A followup strategy called "channeling" was also used extensively. This involved "channeling" people from their homes to the health centers through the active participation of health workers and community leaders who visited each house in a given area once every three months, recorded the vaccination status of pregnant women and young children, and scheduled appointments for those who required vaccinations. Followup visits were made to those who failed to keep their appointments. Continued pursuit of this strategy should help El Salvador's immunization coverage to keep growing in the future.

UNICEF, PAHO, USAID, Rotary International, and the Government of Spain, among others, provided material and technical support for the vaccination effort by supplying vaccines, syringes, administrative and technical personnel training, maintenance crews for the cold chain, printed materials, and technical support for the mass communication activities required.

Rural vaccination posts were located in small villages and refugee camps, and urban vaccination posts were set up in health centers as well as in schools, public buildings, parks, and recreation centers, depending on how many local children were to be vaccinated. Posts were situated so that parents and children would not have to walk more than a few kilometers. The number of vaccination posts in both rural and urban areas was determined by regional committees.

In sum, it seems clear that national vaccination coverage has been raised significantly as a result of this effort, and it is hoped that the channeling strategy, combined with future national vaccination days, will ensure that coverage remains high.

Sources: Pan American Health Organization, *EPI Newsletter* 7(2):1-2, 1985; and J. LeMoyne, Salvador halts war for inoculations, *New York Times,* 22 April 1985.

CANCER INCREASES IN DEVELOPED COUNTRIES

A question often asked but generally left unanswered is whether or not cancer is really increasing around the world. The debate has been joined on many fronts. Some have argued that if cancer mortality is indeed higher than in the past, it is largely a consequence of population aging, since cancer is known to be a disease which primarily affects older adults. Others have claimed that therapeutic advances have had a major impact in reducing deaths from cancers at certain sites. And attention has been drawn to the possible impact of epidemiologic research on the causes of cancer. (That is, certain risk factors have been clearly identified for many years, and so it is worth finding out whether this knowledge has been effectively translated into public health action to reduce mortality.)

With mortality data now available from many developed countries for the early 1980s, it is possible to assess the recent trends in cancer mortality over the last two decades or so. Information on cancer mortality covering the period 1960-1980 (or even later in some cases) is available to WHO for 28 developed countries,[1] the notable exceptions being the USSR and the German Democratic Republic. These data cover roughly 75% of the population of this group of countries. A standard demographic technique—

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[1]The countries are: Australia, Austria, Belgium, Bulgaria, Canada, Czechoslovakia, Denmark, Finland, France, Germany (Federal Republic), Greece, Hungary, Iceland, Ireland, Italy, Japan, the Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Spain, Sweden, Switzerland, Yugoslavia, the United Kingdom (England and Wales, Scotland, and Northern Ireland have been considered separately in this analysis), and the United States of America.

decomposition analysis[2]—has been employed to determine how much of the change in cancer mortality over the period in question is due to a real change in age-specific risks and how much is due to the changing age composition of the population.

Nevertheless, some clarification and caution regarding the interpretation of these latter results is needed. The decomposition analysis merely disaggregates the contribution of demographic factors (a higher proportion of the population surviving to the ages where the death rate [risk] for cancer is highest) from disease-specific trends. An apparent increase in cancer mortality could be due to many factors—including better diagnosis and reporting changes in the International List of Causes of Death—as well as by a real increase in cancer incidence. Any increased risk indicated by the decomposition analysis could well overestimate the actual change in the probability of dying from the disease, although the size of the change is in most cases so great as to be genuinely indicative of real changes in cancer risk. It should also be noted that an apparent decrease in mortality may be due to health interventions; but an apparent decrease in the risk of cancer at certain sites (such as the cervix and stomach) is relatively unlikely to be due to better diagnosis and is strongly suggestive of real changes in cancer mortality.

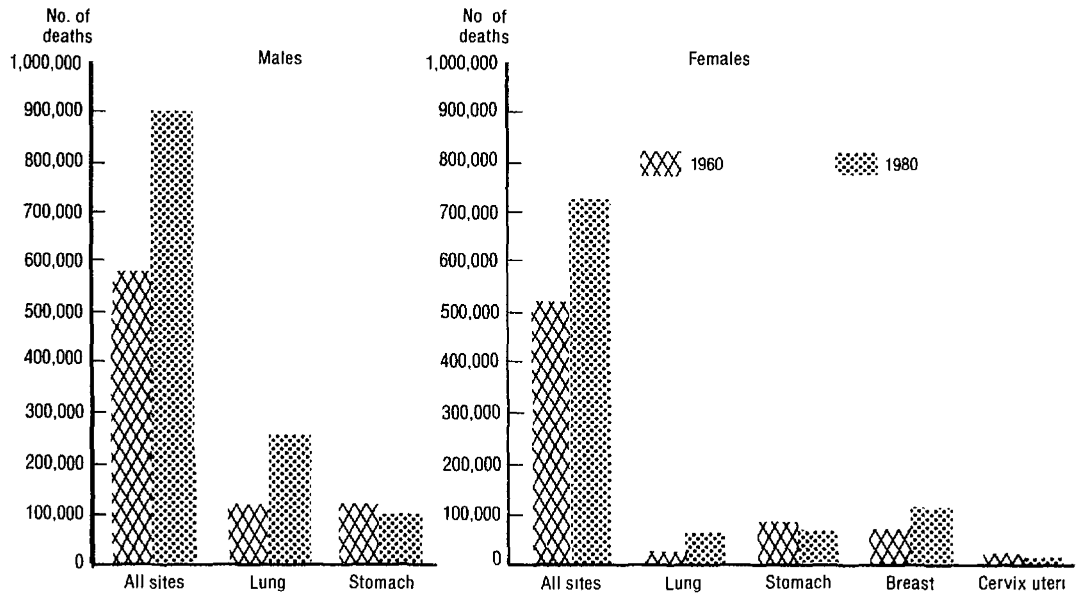
This analysis concentrates on mortality trends relating to four cancer sites of major interest—the lung, breast, stomach, and cervix uteri.

[2]This method allows one to assess the contribution of one factor at a time to the change in a given variable, simultaneously controlling for all other measurable factors influencing change. For a description of the technique, see Kitagawa, E. M., Components of a difference between two rates, *Journal of the American Statistical Association* 50:1168-1194, 1955.

Results for Males

Between 1960 and 1980, the annual average number of male cancer deaths in this group of developed countries rose by 320,000 (from 578,000 to 898,000), or by 55% (Figure 1). Of

Figure 1. The annual average number of deaths from cancers at selected sites in 1960 and 1980, by sex.



this increase, 193,000 deaths (60%) were due to the changing age composition of the population in these countries. That is, in 1980 there was a higher proportion of the population in older age groups—where the risk of dying from cancer is greatest—than there was in 1960. Thus, the "real" increase in the number of cancer deaths among males, controlling for age composition, was 127,000, or 40% of the overall change. The risk of cancer among men—again, keeping the age composition constant—rose in a majority of the countries studied.

Lung Cancer

When analyzed by major cancer site, the data indicated that lung cancer accounted for the largest "real" increase over the study period. The average annual number of cancer deaths from cancer at this site rose by 137,000 (from 118,000 to 255,000). Only about one-fifth (22%) of this rise can be explained by demographic factors; the remainder (an additional 107,000 deaths) arose because of changes in the age-specific risk of dying from the disease. Indeed, of the total "real" increase in mortality from all sites for males (127,000 deaths), 85% (107,000) was due to higher mortality from lung cancer alone.

Other Cancers

The average number of deaths from stomach cancer actually declined by 14,000 (from 119,000 in 1960 to 105,000 in 1980). There would, however, have been more of a decline (to 63,000) were it not for the fact that the aging of the population resulted in more males in the older, high-risk group. That is, the demographic component acted so as to increase the number of male stomach cancer deaths. The net result of these two opposing factors was a 12% decrease in the number of deaths involved.

For cancer at all remaining sites, the annual average number of deaths increased by 197,000 (from 341,000 to 538,000), or 58%.

Results for Females

Overall, the annual average number of female cancer deaths rose from 514,000 in 1960 to 720,000 in 1980, an increase of 40%. However, as Figure 2 shows, this was mainly due to the aging of the female population. Indeed, the absolute increase would have been even greater (218,000 instead of 206,000) as a result of the changing age structure of the population were it not for the fact that the risk of dying from cancer actually declined slightly over the period, primarily because of a substantial drop in mortality from cervical cancer. This decline in deaths from all cancers, controlling for age structure, would have resulted in 12,000 fewer deaths in 1980 than in 1960.

Breast Cancer

Forty-four thousand, or roughly one-fifth of the observed increase in the number of female deaths due to cancer can be attributed to breast cancer, almost half of which (19,000 deaths) arose because of changes in age-specific risk. In no country did the risk of breast cancer decline over the study period.

Cervical Cancer

At first sight, it woud appear that there has been hardly any change in the average annual toll of mortality from malignant neoplasms of the cervix uteri (23,000 deaths in 1960 versus 22,000 in 1980). However, this masks the very different trends of two components (see Figure 2). Controlling for age, the number of deaths from cancers at this site actually declined by 8,000; but this decline was almost entirely offset by an increase in deaths due to the population's changing age structure. The extent of progress against cancer at this site is reflected by the fact that the risk of dying declined in 50% of the countries surveyed.

Lung Cancer

Unquestionably, the largest real cancer mortality increase, for females as for males, was in mortality due to lung cancer. Between 1960 and 1980, the annual average number of female deaths from cancers at this site rose by 44,000 (from 22,000 to 66,000), or by 200%. Only about 9,000 of these 44,000 additional deaths can be attributed to demographic factors.

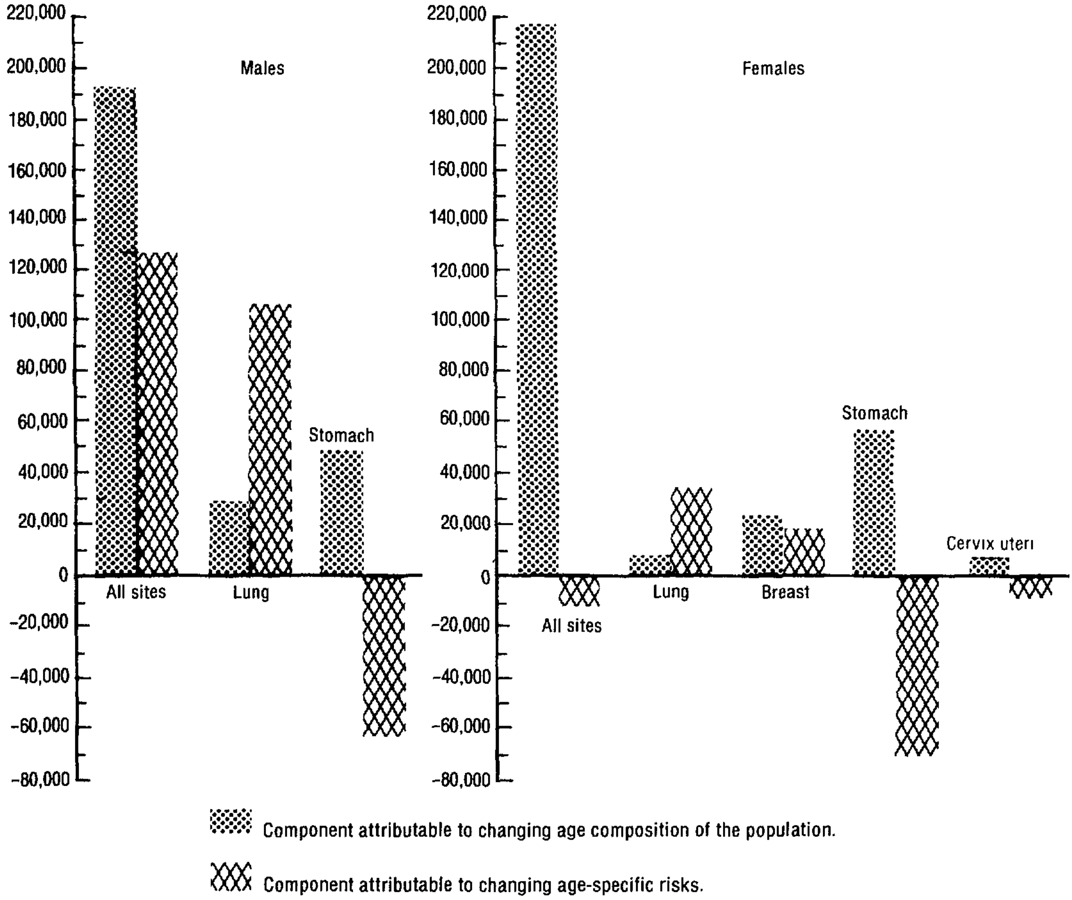
Stomach Cancer

An overall decline in the number of stomach cancer deaths was evident for females as well as for males. Over the study period, the annual average fell by 12,000 deaths (from 84,000 to 72,000). The decline would have been substantially greater (58,000) were it not for the fact that the population's changing age structure led to more women being in older, higher-risk age groups—a circumstance leading to some 46,000 additional deaths per year by 1980.

Other Sites

The annual average number of deaths from all other sites rose by 131,000 (from 311,000 in 1960 to 442,000 in 1980), an increase of 42%.

Figure 2. Age-specific and other components of changing cancer mortality (1960-1980), by site and sex.



Discussion

A preliminary analysis of the potential impact of changes in diagnostic precision and the quality of cause of death data suggests that it is unlikely that the main results presented above are grossly distorted. For instance, the annual number of male deaths ascribed to senility and ill-defined conditions declined by 83,000 (from 191,000 to 108,000). Even if all these deaths had been coded to cancer, this transfer would account for less than 30% of the total increase of 320,000. Similarly for females, the number of deaths ascribed to senility and ill-defined conditions decreased by 108,000 between 1960 and 1980; this figure would only account for slightly more than half of the increase in female deaths (206,000) from cancer assuming all the ill-defined deaths were in fact due to cancer.

In this context it is interesting to study changes occurring in major age groups. Analysis of data for breast cancer in the age group 45-64 years (where diagnosis may be considered reasonably reliable) indicates there were about 35,000 female deaths per year around 1960 and 48,000 around 1980; in other words, there was an increase of about 13,000, or 37%.

Of this increase, about 5,000 deaths can be accounted for by demographic factors and 8,000 (i.e., more than 60%) by higher age-specific death rates (as compared with the 1960 rates). In addition, one has to consider that higher mortality than expected (on the basis of the 1960 rates) was noted in almost all countries.

Similarly, for male lung cancer deaths in the 45-64 age group, there appear to have been some 62,000 male deaths per year around 1960 and some 95,000 around 1980, for an increase of 33,000, or 53%.

Of this increase, only 7,000 deaths are attributable to demographic changes (one-fifth of the increase), while 26,000 (four-fifths) are attributable to higher age-specific risks. Again, one may assume that the quality of the data for this age group is reasonably good, although the results may be influenced by changes within the group.

From this brief analysis, one may conclude that cancer is indeed increasing, mainly because of the aging of the population but also because of age-specific increases in risk for some tumors, principally ones relating to lung cancer. The exceptions to the trend are mortality from cervical cancer and mortality from gastric tumors, both of which have declined.

With regard to the debate about the role of preventive measures and therapy in cancer control, the possibility of preventing tobacco-induced cancers seems not to have been exploited very effectively and has had little, if any, overall impact in reducing mortality from lung cancer. In addition, it would appear that such factors as nonspecific lifestyle changes have been the major cause of the decline in stomach cancer. Early diagnosis through screening has certainly been a major factor in the decline of mortality from cervical cancer, but the impact of therapeutic treatment on overall cancer mortality is less clear.

What is clear, however, is that the consequences of population aging for cancer control programs are substantial, and that lessons to be learned from this analysis have obvious implications for global cancer control strategies. Indeed, in much the same way as has been observed in the developed countries, cancer will increase in the Third World. And so, with continued increases in many developing countries in life expectancy (to nearly 70 years in a number of cases), higher consumption of tobacco, and further successes against infectious diseases, it can be safely predicted that there will be an epidemic of cancer in a majority of the developing countries by the year 2000.

Source: World Health Organization, *Weekly Epidemiological Record* 60(17):125-129, 1985. This article presents the preliminary findings of a study being undertaken jointly by the Cancer Unit and the Unit of Global Epidemiological Surveillance and Health Situation Assessment of the World Health Organization, and by the Regional Cancer Registry, Queen Elizabeth Medical Center, Birmingham, England. Publication of a more detailed analysis is anticipated.