Journal of Public Health Medicine

Vol. 18, No. 3, pp. 329–336
Printed in Great Britain

Changing life expectancy in central Europe: is there a single reason?

Laurent Chenet, Martin McKee, Naomi Fulop, Ferenc Bojan, Helmut Brand, Angela Hort and Pawel Kalbarczyk

Abstract

Background During the 1980s, at a time that life expectancy at birth in western Europe has increased by 2·5 years, it has stagnated or, for some groups, declined in the former socialist countries of central and eastern Europe.
Methods A study was carried out to ascertain the contribution of deaths at different age groups and from different causes to changes in life expectancy at birth in Czechoslovakia, Hungary and Poland between 1979 and 1990.
Results Improvements in infant mortality have been counteracted by deteriorating death rates among young and middle-aged people, with the deterioration commencing as young as late childhood in Hungary but in the thirties or forties in Czechoslovakia and Poland. The leading contributors to this deterioration are cancer and circulatory disease but, in Hungary, cirrhosis and accidents have also been of great importance.
Conclusions The patterns observed in each country differ in the age groups affected and the causes of death Further work is required to explain these differences.

Keywords: mortality, Poland, Hungary, Czechoslovakia

Introduction

The widening health gap between the peoples of the former socialist countries of central and eastern Europe and those in western Europe is now widely recognized.[1,2] The improvements in male and female life expectancy at birth seen in western Europe between 1979 and 1990 have not occurred in Czechoslovakia, Hungary or Poland. All of the central European countries have experienced either a deterioration or a very slight increase in life expectancy at birth whereas the European Union average increased by over 2·5 years for both sexes.[3]

Life expectancy does not measure death rates directly but rather is an indicator of the consequences of period mortality effects over the hypothetical lifetime of individuals.[4] Differentials in life expectancy between populations can be studied using the method devised by Pollard to examine the effect of deaths at various ages and from different causes[5] and subsequently used to examine differences between populations in different countries and at different times.[6]

This paper examines the extent to which specific causes of death and their impact on different age groups have contributed to the failure by three of the wealthiest of the former socialist countries of central and eastern Europe, Czechoslovakia, Poland, and Hungary, to achieve the improvements in life expectancy seen in western Europe during the 1980s.

Methods

The study analysed mortality data from the World Health Organization mortality tapes, classified according to the abbreviated ninth revision of the International Classification of Diseases (ICD), for the years 1979 (Poland – 1980) to 1990. These years were chosen because the latter was the most recent year for which comparable information was available in all countries and the former was the first in which the ninth revision of the ICD was used, as a comparison using different

Health Services Research Unit, London School of Hygiene and Tropical Medicine, Keppel Street, London WC1E 7HT.

LAURENT CHENET, Research Fellow

MARTIN McKEE, Reader in Public Health Medicine

NAOMI FULOP, Lecturer in Public Health

Department of Social Medicine, Medical University of Debrecen, Debrecen, H-4012, Hungary.

FERENC BOJAN, Professor of Public Health

Amt für Gesundheits- und Veterinarwesen, Tesdorpfstrasse 8, D-20148 Hamburg, Germany.

HELMUT BRAND, Public Health Specialist

ANGELA HORT, Research Fellow

School of Public Health, Grzegorzecka 20, Krakow, Poland.

PAWEL KALBARCZYK, Research Fellow

Address correspondence to Dr M. McKee.

TABLE 1 Constituents of disease categories used in study

Disease group	Abbreviated ICD9 codes
Infectious diseases	010–078
Respiratory cancer	100–101
Malignant diseases	080–096, 110–170
Circulatory diseases	250–281, 300–305
Cerebrovascular diseases	290–294
Respiratory diseases	310–327
Genito-urinary diseases	350–376
Obstetrics	380–410
Congenital/perinatal	440–455
Accidents and injuries	470–56
Cirrhosis	347
Others	180–200, 210–218, 220–241, 330–331, 340–346, 348, 420–437, 460–467

versions of the ICD could present definitional problems. In addition, 1990 was the final year of communist rule. Although the pattern of mortality in subsequent years clearly owes much to events during this period, it is also influenced by certain factors with a short-term effect on mortality, such as increasing accidents, and thus it is difficult to separate the subsequent effects of economic transformation, although this is the subject of further study.

The abbreviated causes of death were brought together to create a smaller series of clinically meaningful categories (Table 1). These were selected using the criteria of numbers of deaths and association with known risk factors. The contribution of each of these categories in each five-year age group (although the 0–1 age group was analysed separately) to the overall change in life expectancy between the years 1979 and 1990 was calculated.

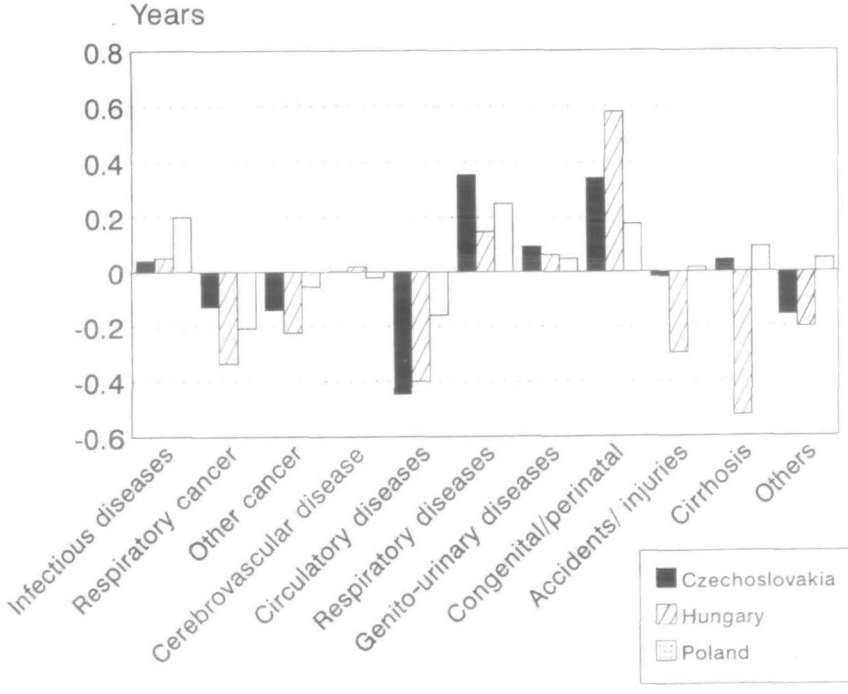

FIGURE 1 Contribution of causes of death to change in male life expectancy at birth, 1979–1990 (Poland 1980–1990).

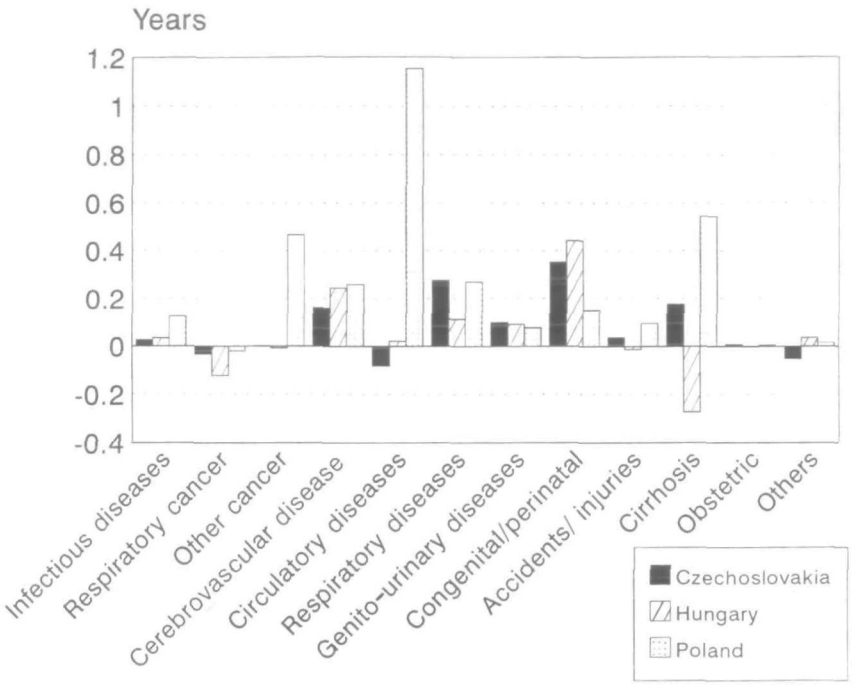

FIGURE 2 Contribution of causes of death to change in female life expectancy at birth, 1979–1990 (Poland 1980–1990).

As noted above, the approach developed by Pollard was used. This is described in the Appendix.

Results

The contribution in each country of each category of cause of death is shown in Figs 1 and 2. The contribution of deaths in each age group is shown in Figs 3 and 4. In both cases, the sum of the contributions across either all age groups or all disease categories equates to the overall change in life expectancy. For example, in each country there were substantial improvements in infant mortality, without which the change in life expectancy at birth would have been between 0·36 and 0·65 of a year lower.

For males, in each of the central European countries, changes in numbers of deaths among the young and the very elderly have had a net effect of improving life expectancy. These have been compensated for by a considerable deterioration among the middle aged. The age at which this net negative effect begins to be seen consistently is much lower (early twenties) in Hungary than in Czechoslovakia (early thirties) or Poland (late forties).

The relatively poor position of Hungary is also seen for females, where there has been a net negative contribution to the change in life expectancy from late childhood through to the early fifties. In Czechoslovakia, death rates have stagnated other than among the very young and over-50s. In Poland, in contrast, improvements in deaths in nearly all age groups have produced a much greater improvement in life expectancy than in the other countries.

When analysed by cause of death, reductions in deaths from respiratory, genito-urinary and congenital diseases make positive contributions to life expectancy in both sexes and in all countries, although the magnitude of change varies. For other causes, the pattern is more variable. Among men, in Czechoslovakia and Poland, the largest negative contributions to life expectancy are due to circulatory diseases, lung cancer and other cancers. In Hungary, however, the largest single negative contribution was from cirrhosis, accounting for more than half a year, closely followed by circulatory disease, lung cancer, accidents and then other cancers.

Among women, in Czechoslovakia small negative contributions have been made by lung cancer and circulatory disorders. In contrast, Polish females, with their general improvement in life expectancy, have only suffered negative contributions from lung cancer. Hungarian women have also experienced negative contributions from lung cancer, with a very small contribution from accidents but, like their male

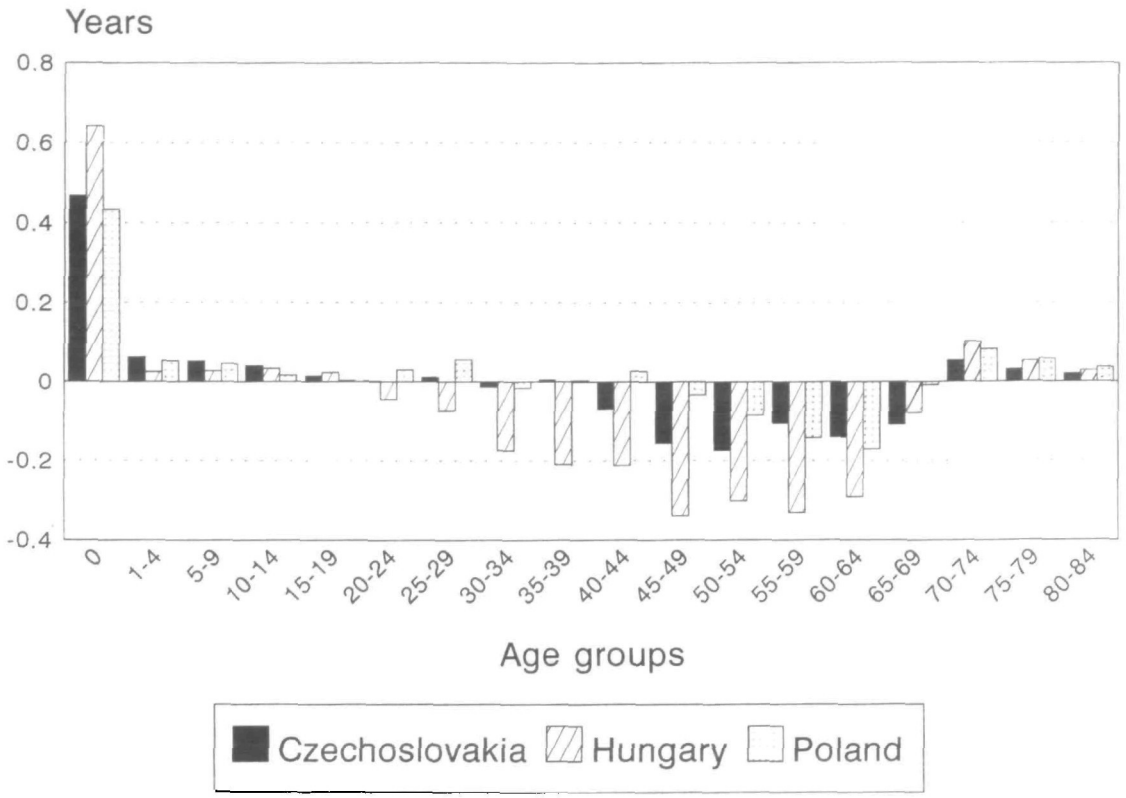

FIGURE 3 *Contribution of deaths in each age group to change in male life expectancy at birth, 1979–1990 (Poland 1980–1990).*

counterparts, the major negative contribution has come from cirrhosis.

Discussion

Life expectancy at birth is a convenient summary measure of the mortality experience of a population but it also suffers from the drawbacks of condensing a large amount of information into a single indicator. Among modern industrialized countries the failure of the central and eastern European countries to improve their health status in recent years is unparalleled. Although trends in major diseases have been described for these countries, this is the first time that they have been related specifically to changes in life expectancy. The information from this analysis will assist policy-makers in each country to assess priorities in the field of health and social policy.

Whereas the current analysis goes beyond the summary measure of life expectancy, on the grounds of space, the data presented here still simplify the true picture, which requires study of the contribution of each cause in each age group (tables available from M.McK.). This shows that, for example, the apparent improvements in deaths from circulatory disease and cirrhosis among Polish women are due almost entirely to reductions among those over 65 with, in both cases, a slight deterioration in younger age groups.

Even at this summary level, these data provide considerable information on the changing health status in this region during the 1980s. Perhaps the most striking point to note is the major contribution that has been made by improvements in infant mortality, without which the overall life expectancy figures would be even worse. As the infant mortality rates remain higher than in western Europe, further improvements in this area could compensate for further deterioration in older age groups, thus giving a misleading impression if the single figure for life expectancy at birth is being considered.

Any international comparison of causes of death is susceptible to differences in coding practice,[7] although this will not affect the analysis by age of death. We cannot exclude that this will have some

FIGURE 4 Contribution of deaths in each age group to change in female life expectancy at birth, 1979–1990 (Poland 1980–1990).

effect on the results obtained, but the use of broad categories, the study of change within countries, and the limitation to a single revision of the International Classification of Diseases eliminate many problems. Furthermore, significant changes in coding practice would be expected to produce major discontinuities in data, as seen when versions of the International Classification of Disease change. These did not occur during this period. One study, in Hungary, that compared autopsy data with death certificates and the results of pre-mortem examinations found that the major effect of an autopsy was to increase the number of listed diagnoses rather than change the primary causes of death.[8] In this study, many of the observed differences are so large, and the categories involved so disparate, such as circulatory diseases, accidents, and cirrhosis, that misclassification is unlikely to be a great problem.

From a western perspective, there has been a tendency to consider this region as homogeneous, despite the very different cultures and traditions of the countries concerned. This study demonstrates the variation among these countries in the magnitude of the problem, its rate of change, the age groups affected, and the contribution of different causes of death. The implication for international agencies and their consultants working in these countries is that proposed policies need to take into account local circumstances. A detailed assessment of the policy changes required is beyond the scope of this paper. None the less, some issues are apparent.

The challenge facing Hungary is particularly dramatic. It has experienced the greatest health problems, especially among relatively young men. Increased deaths in the 30–49 age group account for a reduction in life expectancy at birth of 1·36 years during this period. These results indicate clearly the contribution of alcohol to the worsening health status. If it is assumed that alcohol is responsible for all deaths from cirrhosis and, conservatively, 50 per cent of accidents, then a net decline in male life expectancy at birth of two-thirds of a year may be attributable to alcohol. Furthermore, this does not include any contribution of alcohol to either cardiovascular or malignant disease. This is consistent with

the observation that the age-standardized death rate from chronic liver disease and cirrhosis has almost doubled for both males and females in Hungary during the 1980s whereas there has been a slight decline in Poland and only a small increase in Czechoslovakia.[3]

It is more difficult to relate these figures to statistics on alcohol consumption. Data supplied to the World Health Organization suggest that annual pure alcohol consumption in Hungary in 1990 was 10·8 litres per capita, compared with 8·8 litres in Czechoslovakia, 6·2 litres in Poland, and 7·5 litres in the European Union.[3] Unfortunately, official data on alcohol consumption in central Europe are thought to be considerable underestimates as they are based on output figures from large producers and do not capture alcohol imports, smuggling, illicit production and, more recently, legal production by small private producers.[9] Perhaps more relevant is the observation that the traditional Hungarian consumption of wine is being displaced by increasing quantities of spirits and, even on the basis of official statistics, the per capita consumption of spirits in Hungary has increased by a factor of five between 1951 and 1991.[10] We are currently conducting a major study of alcohol consumption and policy responses in Hungary that will shed more light on this issue.

The impact of alcohol on decreasing male life expectancy at birth is consistent with evidence from Russia following the introduction of an anti-alcohol campaign between 1985 and 1988.[11] Male life expectancy at birth increased from 62·7 years in 1985 to 64·9 years in 1987. Over the same period there was a decrease in official measures of annual pure alcohol consumption from 8·8 litres per capita to 3·9 litres. As in central Europe, for the reasons noted above, both figures are almost certainly an underestimate of the true level, but estimates derived from much more detailed analysis also indicate a substantial, if short-lived decline in alcohol consumption after 1985.[12] The campaign included: reducing access to alcohol by limiting the number of commercial outlets, increasing prices, and reducing hours when alcohol could be purchased; police action against alcoholics; and media campaigns and the creation of an anti-alcohol movement.[13]

The adverse consequences for life expectancy of circulatory diseases and lung cancer highlight the role of tobacco consumption. In the case of lung cancer alone, among men it contributed a decrease of a third of a year in Hungary, a fifth of a year in Poland, and an eighth of a year in Czechoslovakia. In 1990, the age-standardized death rate from cancer of the trachea, bronchus and lung, among men in the three central European countries was approximately 40 per cent higher than in the European Union.[3] The rate is continuing to increase in the former but is declining in the latter. Among women, the rates in Czechoslovakia and Poland were similar to the average for the European Union, but in Hungary, it was over twice as high. Whereas the western European rate is beginning to level off, those in central Europe are still increasing. Again, official consumption statistics[3] are of limited help but, with caveats, they indicate that the number of cigarettes consumed per capita per year in 1990 was 1859 in Czechoslovakia, 2749 in Hungary, and 2700 in Poland, compared with 2167 in the European Union. Unpublished data from Poland (1990) and the Czech Republic (1991) indicate that the percentages of male smokers are 38 per cent and 34 per cent, somewhat higher than in many western European countries.

Peto *et al.*[14] have estimated the percentage of all deaths that could be attributed to tobacco consumption in 1990 among men to be 25 per cent in Hungary, 29 per cent in the Czech Republic, 26 per cent in Slovakia, 29 per cent in Poland and 15 per cent in the European Union. The difference is less marked among women, accounting for 9 per cent of deaths in Hungary, 5 per cent in the Czech Republic, 3 per cent in Slovakia, 5 per cent in Poland and 5 per cent in the European Union. In both cases, however, the figures represent the culmination of smoking history over the past 20 years, and the impact of tobacco in central Europe is likely to increase considerably in the future.

Nutritional patterns are also likely to have contributed to the deteriorating situation with regard to circulatory disease and cancer. It has been noted that the standard diet in the region, especially among the poor and in cities, is characterized by a high consumption of cholesterol-rich foods, sugar, salt, bread and alcohol.[9] Furthermore, risk factor surveys have found high prevalences of elevated blood cholesterol and hypertension[15,16] that are especially marked in individuals with lower educational levels.[17]

This study has examined the experience during the period of communist rule during the 1980s. Since then, there have been further changes in life expectancy, with a further decline of 0·5 of a year for males in Hungary between 1990 and 1992 although the figure for women has remained unchanged. In the Czech and Slovak Republics and in Poland there has been little change in this period, except for Czech men, who have experienced an increase of one year.[9] As noted above, this is the subject of further research.

Analysis by cause of death is only a first step to unravelling the complex relationship between changes in economic circumstances, lifestyle, exposure to risk

factors, curative services and, ultimately, health outcome. For example, there is some evidence that weaknesses in the curative sector have contributed to the situation[18] with, for example, death rates from childhood cancers twice those seen in western Europe.[19] Much more detailed analysis of changes in cause of death, incorporating validation of diagnostic coding, is under way, as are further studies of exposure to risk factors and of the more general effects of aspects of culture, geography and politics. For example, other work has shown that the increasing death rate among Hungarian males has been by far the greatest among those who are widowed or divorced,[20] the death rate from breast cancer in Poland is much higher in those living in Warsaw than in rural areas,[21] and Makara has identified a series of characteristics of the regimes in power in the post-war period that have contributed to the poor health status.[22]

This region offers an important opportunity to examine further the nature of the relationship between material deprivation, exposure to risk factors, and subsequently outcome. There has been relatively little work in the region on inequalities in health among different social classes, recognizing the uncertainty of how inequality should be defined in this setting.[23] There is also a need to examine the health status of groups at the margins of society, such as the gypsy people who make up a considerable proportion of the population in this region, especially in Hungary. This study makes a small contribution to the process of understanding this complex human tragedy.

Acknowledgement

This work was supported by the European Commission COPERNICUS Programme [Contract number CIPACT930247 (ERB 3510 PL 92 4074)].

References

1 Forster DP, Jozan P. Health in eastern Europe. *Lancet* 1990; **335:** 458–460.
2 UNICEF. *Public policy and social conditions.* Florence: UNICEF, 1993.
3 World Health Organization. *Health for all database.* Copenhagen: WHO, 1994.
4 Vallin J, Meslé F. L'incidence des causes de décès sur l'espérance de vie. In: *Les causes de décès en France de 1925 à 1978.* INED Travaux et Documents, Cahier No. 115. Paris: INED, 1988.
5 Pollard JH. The expectation of life and its relationship to mortality. *J Inst Actuaries* 1982; **9:** 225–240.
6 Pollard JH. Cause of death and expectation of life: some international comparisons. In: Vallin J, D'Souza S, Palloni A, eds. *Measurement and analysis of mortality: new approaches.* Liège: Oxford University Press, 1987: 269–291.
7 Stebhens WE. An appraisal of the epidemic rise of coronary heart disease and its decline. *Lancet* 1987; **i:** 606–609.
8 Karolyi G, Karolyi P. Value of mortality data and necropsy records in monitoring morbidity in a population. *J Epidemiol Commun Hlth* 1991; **45:** 238–243.
9 UNICEF. *Crisis in mortality, health and nutrition.* Florence: UNICEF, 1994.
10 Hungarian Government. A Hosszútávú Egészségfejlesztési Politika Alapelveiről Szóló Program. Népjóléti Közlöny (Különszám). [Programme of basic principles of long term health development policy.] Budapest: Ministry of Welfare, 1994.
11 McKee M, Chenet L. Alcoholism and rising mortality in the Russian Federation. *Br Med J* 1995; **310:** 1668–1669.
12 Nemtsov AV. Uroven realnovo potriebleniya alkogolya v Rossiyskoi Federatsii (1981–1990gg). [The real level of alcohol consumption in the Russian Federation (1981–1990).] *Sotsial Klin Psychiat* 1992; **4:** 46–53.
13 Tarschys D. The success of a failure: Gorbachev's alcohol policy, 1985–88. *Europe–Asia Studies* 1993; **45:** 7–25.
14 Peto R, Lopez AD, Boreham J, Thun M, Heath C. *Mortality from smoking in developed countries 1950–2000.* Oxford: Oxford University Press, 1994.
15 Mark L, Katona A, Deli L. An attempt to evaluate the risk factors related to coronary heart disease in Hungary. *Cor Vasa* 1991; **33:** 265–272.
16 Skodova Z, Pisa Z, Emrova R, *et al.* Cardiovascular risk factors in the Czech population. *Cor Vasa* 1991; **33:** 114–122.
17 Wagrowska H, Rywik S, Piotrowski W. Relationship between IHD risk factors and educational level in the Warsaw Pol-MONICA population. *Rev Epidemiol Santé Publ* 1990; **38:** 501–506.
18 Bojan F, Hajdu P, Belicza E. Avoidable mortality: is it an indicator of quality of medical care in Eastern European countries? *Qual Assur Hlth Care* 1991; **3:** 191–203.
19 Levi F, La Vecchia C, Lucchini F, Negri E, Boyle P. Patterns of childhood cancer incidence and mortality in Europe. *Eur J Cancer* 1992; **28A:** 2028–2049.
20 Hajdu P, McKee M, Bojan F. Changes in premature mortality differentials by marital status in Hungary and in England and Wales. *Eur J Publ Hlth* 1995, **5:** 259–264.
21 Wronkowski Z, Bielska-Lasota M, Zielinski J, Romejko M. Striking differences in the epidemiological picture of breast cancer in urban and rural areas in Poland. *Eur J Gynaecol Oncol* 1993; **14**(Suppl): 179–193.
22 Makara P. Dilemmas of health promotion and political changes in Eastern Europe. *Health Promotion Int* 1991; **6:** 41–47.
23 Orosz E. The Hungarian country profile: inequalities in health and health care in Hungary. *Social Sci Med* 1990; **31:** 847–857.

Accepted on 9 January 1996

Appendix – method of comparing the contribution of deaths in age groups and from specific causes to differences in life expectancy in two populations

Designating life expectancy at birth for populations 1 and 2 as e_0^1 and e_0^2, the difference between the two life

expectancies can be written

$$e_0^1 - e_0^2 = \sum {}_n\left({}_nm_x^{(i)1} - {}_nm_x^{(i)2}\right).w_x$$

where ${}_nm_x(i)$ is the central mortality rate for cause i between age x and $x+n$.

The weight w_x is given by the formula

$$w_x = \frac{1}{2}\left({}_xp_0^2 e_x^1 + {}_xp_0^1 e_x^2\right)$$

where ${}_xp_0$ is the life table probability of surviving from birth to age x and e_x is the life expectancy at age x, that is, the mean numbers of years left.

This could also be written as

$$e_0^2 - e_0^1 = \sum_x \sum_i \left(Q_x^{(i)1} - Q_x^{(i)2}\right) w_x$$

with

$$Q_x = -\ln\left(\frac{l_{x+n}}{l_x}\right)$$

where l_x is the life table number of people alive at age exact x.

The quantities

$$\left(Q_x^{(i)1} - Q_x^{(i)2}\right) w_x$$

give the weight of each cause in the difference observed between the two life expectancies.

The sum over all ages gives the total contribution for each cause i in that difference whereas the sum over causes would give the relative weight of mortality at each age x.