PAPERS

Mortality from causes amenable and non-amenable to medical care: the experience of eastern Europe

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Abstract

Objective—To investigate comparative national trends in mortality from conditions amenable to timely, appropriate medical care and from those considered not to be amenable to such care.

Design—Analysis of trends in direct age standardised mortality from the 1950s to 1987.

Setting—Four eastern European nations (Hungary, Czechoslovakia, Poland, the German Democratic Republic) and two western European (the Federal Republic of Germany and England and Wales) and two North American nations (United States and Canada).

Subjects—The total populations of the relevant countries during the period examined.

Main outcome measures—Proportional changes over time in age standardised mortality. Mortality from amenable and non-amenable causes was restricted to the age group 0-64.

Results—A divergence in the trends for all cause mortality between eastern Europe and the western nations occurred in about 1970, when the rates in western countries steadily declined but those in eastern Europe remained fairly static. In the age group 0-64 mortality from causes considered amenable to medical care fell less quickly in eastern Europe than in the West, particularly after 1970. In the same age group, mortality from non-amenable causes rose in eastern European countries from the late 1960s compared with substantial declines in such mortality in the West.

Conclusions—Non-amenable causes of death seem to be the principal, but not exclusive, reason for lack of improvement in trends in all cause mortality in eastern Europe from 1970. The agenda for action in eastern Europe should give priority to a healthier lifestyle and improvement of the environment though not neglect enhancements in the quality and efficiency of direct health services.

Introduction

Analyses of the secular trends in death rates in England and Wales and the United States between 1901 and the early 1970s suggested that medical measures seem to have contributed little to the overall decline in mortality.[1,2] Regression analysis in cross sectional studies in the same countries showed that the variation in mortality is more sensitive to socioeconomic characteristics, environmental conditions, and the effects of education than to the provision of medical care.[3,4] Rutstein *et al*, however, developed a list of measurable negative indices relevant to the quality of medical care.[5,6] Subsequently, this list of diseases for which, with appropriate, timely medical care, it was considered that death should not occur or occur rarely, was used to study "avoidable" or "amenable" mortality.[7]

The all cause mortality experienced by eastern European countries in the late 1980s were achieved in western Europe in the late 1950s.[8] The question is whether this 30 year time delay was due mainly to differences in medical care or to those in the environment and personal health behaviour. The objective of this paper, therefore, was to examine and compare time trends in mortality from 1950 onwards for conditions amenable and non-amenable to timely medical care in four former eastern bloc states and two western European and two North American democracies.

Methods

We used mortality data from computer tape transcripts held by the World Health Organisation's data bank in the analysis.[9] Trends in mortality from 1950 to 1987 were examined for nine countries: Hungary, Czechoslovakia, Poland, the German Democratic Republic, the Federal Republic of Germany, England and Wales, the US, and Canada. The transcripts contain mortality data classified by age and sex according to the International Classification of Diseases in summarised categories. Data were drawn from the 6th, 7th (Intermediate A list of 150 causes), 8th (A list), and 9th revisions (Basic B list) of the classification (ICD-6 to ICD-9). Throughout the period examined, equivalent diagnostic categories of the ICD were used and the alignment of the various revisions was checked.[10] Graphs of trends in death rates for individual diagnostic groups for each country were examined to detect any substantial alterations in rates from year to year, particularly for years in which the ICD changed from one edition to another. For example, in Czechoslovakia in 1960, deaths previously classified as cerebrovascular disease were subsequently placed in the hypertensive disease category. This procedure was reversed towards 1968. Thus the categories hypertensive disease and cerebrovascular disease were amalgamated to ensure consistent interpretation. Data were missing for some countries and diagnoses, especially in the early part of the period—for example, for deaths from all causes in Hungary 1950-4, Czechoslovakia 1950-2, Poland 1950-8, the German Democratic Republic 1950-72, and the Federal Republic of Germany 1950-1.

All mortality data were age standardised by the direct method using the European standard population,[11] which was selected in preference to the world standard population as that is weighted towards the younger age groups typical of developing countries. The standardisation process used one year age bands up to age 5 years and thereafter in five year age groups. Predominantly, the standardisation was carried out within two separate broad age groups: 0-64 and 65 and over.

The selection of diagnostic categories amenable to

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medical care was derived from the list of unnecessary untimely deaths by Rutstein *et al.*[6] Thus conditions in particular age groups amenable to primary prevention by medical means (for example, acute poliomyelitis) or secondary prevention through effective treatment (for example, appendicitis) were included. Conditions responsive mainly to changes in health related behaviour (for example, carcinoma of the bronchus) or to changes in behaviour and the condition of population in which they occurred (for example, violent deaths) or environmental changes were designated as non-amenable. The differentiation of conditions into those amenable and non-amenable to medical care was restricted to the broad age group 0-64, though for some amenable conditions the concept of avoidability was sometimes confined to more specific age groups. The mortalities for the aggregate amenable and non-amenable categories presented were always recalculated with reference to the broad age group 0-64. Table I sets out the categories of amenable conditions.

Comparable data for each country in the transcripts for Hodgkin's disease were available only from 1979 and for ischaemic heart disease from 1968 onwards. Hodgkin's disease, which contributed only a small proportion of all amenable causes, was omitted from this aggregate group for the analysis of time trends. The ischaemic heart disease category was analysed separately for three reasons: firstly, because of the lack of comparable international data before 1968; secondly, because of the large contribution of this disease to total death rates; and, thirdly, because the disease probably represents an interplay of health behaviour and medical care factors. Coronary heart

disease is widely thought to be responsive to primary prevention by changed behaviour related to health, although the evidence from controlled trials is modest.[12] Effective secondary prevention in the acute myocardial infarct component of ischaemic heart disease alone has been revolutionised during the 1980s by the use of aspirin and fibrinolytic treatment.[13] The aggregate group of non-amenable causes was therefore calculated in two ways: by including and excluding ischaemic heart disease.

For graphical presentation the death rates in certain countries were combined. The combinations used reflected logical groupings and the fact that the rates for the individual countries in a group tended to be broadly similar and show similar secular changes. For each combination of countries used in the figure the appropriate weighting of death rates by population size was applied.

Results

Table II shows the changes in the all cause standardised death rates per 100 000 European standard population in the age groups 0-64 and 65 and over between three time periods. The three eastern European nations, Hungary, Czechoslovakia, and Poland, for which data were available in the 1950s and '60s, showed reductions in the standardised rates in the age band 0-64 until the mid-1960s. This initial decrease in mortality was followed by a failure to improve further and an actual rise in the 1970s and 1980s in Hungary and Poland. In contrast, the western countries showed continuous improvement in mortality, albeit with

TABLE I—*Conditions amenable to medical care, age group 0-64*

Diagnostic category	Age group (years)	ICD-6 and ICD-7	ICD-8	ICD-9
				ICD code
Cholera	0-64	043, 040	000, 001	001
Typhoid fever				002·0
Tuberculosis	0-64	001-008, 010-019	010-019	010-018, 137
Diphtheria, tetanus, and acute poliomyelitis	0-64	055, 061, 080	032, 037, 040-043	032, 037, 045
Whooping cough; streptococcal sore throat; scarlet fever, and erysipelas; and measles	0-14	056, 050, 051, 085	033, 034, 035, 055	033, 034, 035, 055
Syphilis	0-64	020-029	090-097	090-097
Cervical cancer	15-64	171	180	180
Hodgkin's disease	0-34			201
Diabetes mellitus	0-49	260	250	250
Non-toxic goitre and thyrotoxicosis, with or without goitre	0-64	250-252	240-242	240-246
Avitaminoses and nutritional deficiencies	0-64	280-286	260-269	260-269
Epilepsy	0-64	353	345	345
Acute rheumatic fever and chronic rheumatic heart disease	0-49	400-402, 410-416	390-392, 393-398	390-392, 393-398
Hypertensive disease and cerebrovascular disease	35-64	330-334, 440-443, 444-447	400-404, 430-438	401-405, 430-438
Pneumonia, bronchitis, emphysema, and asthma	0-49	490-493, 500-502	480-486, 490-493	480-486, 490-493
Peptic ulcer	5-64	540, 541	531-533	531-533
Appendicitis	0-64	550-553	540-543	540-543
Intestinal obstruction and hernia	0-64	560, 561, 570	550-553, 560	550-553, 560
Cholelithiasis and cholecystitis	5-64	584, 585	574, 575	574-575·1
Infections of skin and subcutaneous tissue, otitis media or mastoiditis, osteomyelitis and periostitis, and meningococcal infections	0-64	690-698, 391-393, 730, 057	680-686, 381-383, 720, 036	680-686, 381-383, 730, 036
Maternal mortality	All maternal ages	640-652, 660, 670-689	630-645, 650-662, 670-678	630-646, 651-676, 670-678
Certain conditions originating in perinatal period	0-1	760-776	760-779	760-779

TABLE II—*Secular changes in all causes mortality (directly standardised per 100 000 European standard population)*

Age group (years)	Period	Hungary	Czechoslovakia*	Poland†	German Democratic Republic‡	Federal Republic of Germany	England and Wales	Canada	US
0-64	Rate per 100 000 1985-7	520·0	422·9	446·7	338·1	282·2	287·0	268·8	330·0
	% Change 1955-9 to 1970-4	−14·2	−4·0	−25·2		−14·2	−10·2	−14·5	−8·7
	% Change 1970-4 to 1985-7	17·0	−3·2	7·3	−3·8	−27·3	−22·0	−28·4	−26·2
≥65	Rate per 100 000 1985-7	7268·5	7528·6	6920·2	7034·8	5433·8	5643·7	4730·3	4863·7
	% Change 1955-9 to 1970-4	−3·9	0·8	−4·7		−9·9	−9·3	−15·6	−10·4
	% Change 1970-4 to 1985-7	−4·2	−2·1	1·7	−5·9	−23·7	−15·4	−16·6	−17·4
All ages	Rate per 100 000 1985-7	1262·3	1204·5	1158·8	1074·7	848·9	876·3	759·6	828·7
	% Change 1955-9 to 1970-4	−7·5	−0·7	−12·6		−11·3	−9·6	−15·6	−9·8
	% Change 1970-4 to 1985-7	2·6	−2·5	3·6	−5·3	−24·8	−17·5	−20·7	−20·7

*Data recorded for 1985-7 are based on 1985 and 1986 data alone.
†Data recorded for 1955-9 are based on 1959 alone.
‡Data missing for 1955-9; data recorded for 1970-4 are based on 1973 and 1974 data alone.

Age group (years)	Period	Hungary	Czechoslovakia*	Poland†	German Democratic Republic‡	Federal Republic of Germany	England and Wales	Canada	US
	Amenable deaths§ (excluding Hodgkin's disease)								
0-64	Rate per 100 000 1985-7	103·8	72·5	76·0	57·1	29·0	35·0	22·3	33·1
	% Change 1955-9 to 1970-4	-33·5	-28·3	-42·2		-42·5	-40·4	-50·7	-46·4
	% Change 1970-4 to 1985-7	-14·7	-28·2	-22·6	-26·5	-61·6	-49·7	-60·1	-51·2
	Non-amenable deaths‖ (including ischaemic heart disease)								
0-64	Rate per 100 000 1985-7	416·2	351·6	370·7	281·9	253·2	252·0	246·5	296·9
	% Change 1955-9 to 1970-4	-3·6	6·9	-17·7		-2·5	4·8	-1·9	4·4
	% Change 1970-4 to 1985-7	29·0	4·6	16·5	2·9	-19·0	-15·5	-22·9	-21·7
	Non-amenable deaths (excluding ischaemic heart disease)								
0-64	Rate per 100 000 1985-7	294·8	239·8	275·4	216·6	187·7	159·0	174·1	215·0
	% Change 1970-4 to 1985-7	26·1	2·2	9·5	0·5	-20·1	-15·7	-15·2	-10·5
	Ischaemic heart disease¶								
25-64	Rate per 100 000 1985-7	142·4	137·8	102·7	65·0	71·1	123·1	85·5	92·8
	% Change 1970-4 to 1985-7	41·8	13·4	71·4	22·0	-12·9	-14·9	-42·7	-49·3

*Data recorded for 1985-7 are based on 1985 and 1986 data alone.
†Data recorded for 1955-9 are based on 1959 data alone.
‡Data missing for 1955-9; data recorded for 1970-4 are based on 1973 and 1974 data alone.
§Sum of the deaths in the categories and age groups in table II but excluding Hodgkin's disease.
‖Sum of deaths occurring outside the categories and age groups in table II.
¶Ischaemic heart disease during 1970-4 consists of ICD-8 codes 410-414 and during 1985-7 of ICD-9 codes 410-414.
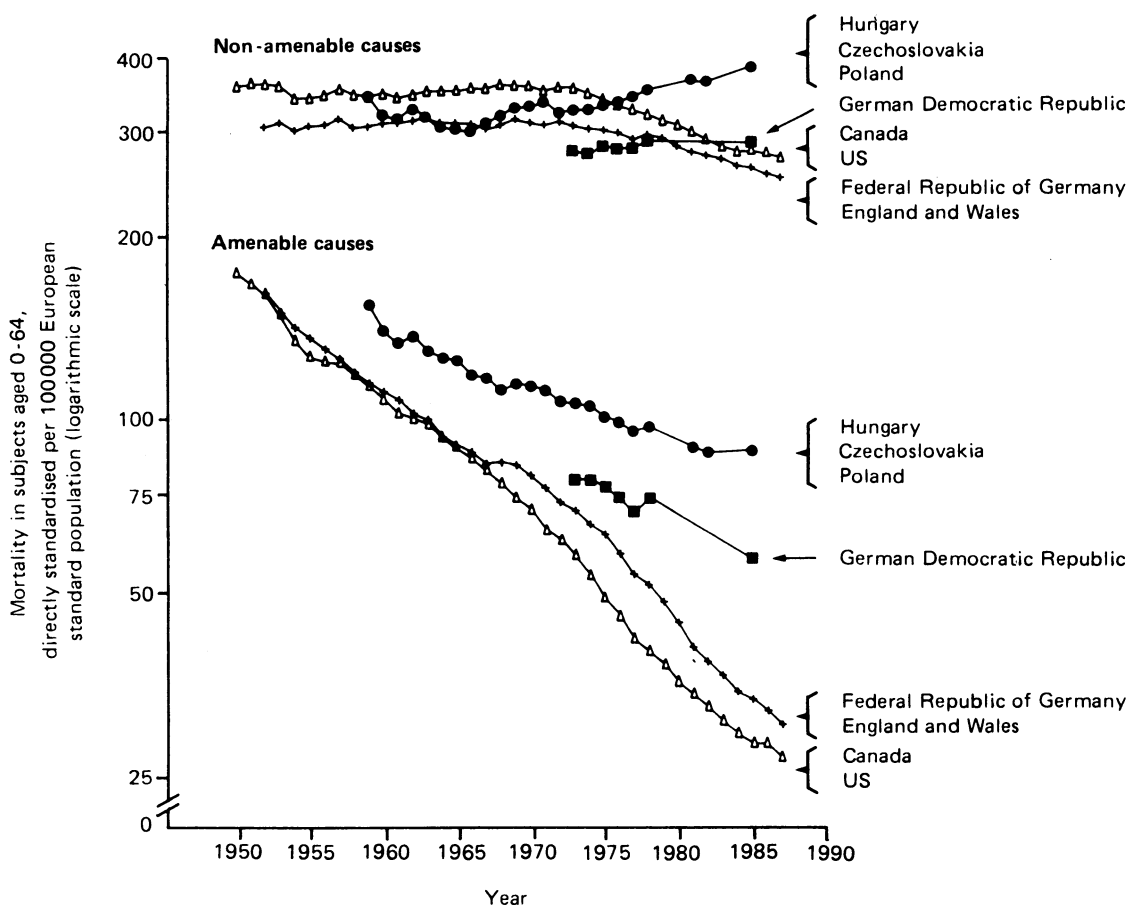
Trends in age standardised mortality from amenable and non-amenable causes among subjects aged 0-64

small fluctuations, and with an acceleration in the rate of decrease in the 0-64 age group occurring in the early 1970s.

When the standardised death rates in those aged 65 and over were considered the long term trend was for the eastern European countries to show small improvements over the period, having started from a position in the 1950s similar to that of the western European nations. Canada and the US showed the lowest standardised death rates among elderly people in the late 1980s, having exhibited a consistent reduction in the rates with time. The standardised death rates in England and Wales and the Federal Republic of Germany in the 1980s were intermediate between those of eastern Europe and North America, though the rate of reduction was accelerating (table II).

The figure illustrates the trends in the standardised death rates for aggregated amenable and non-amenable (including ischaemic heart disease) conditions for the age group 0-64 for groups of countries. Table III shows the equivalent data together with those for ischaemic heart disease in three time periods for each country separately. With respect to amenable conditions, all countries showed a continuous rate of decrease, though that for the western democracies was considerably more rapid than for Hungary, Czechoslovakia, Poland, and the German Democratic Republic. Indeed, when the change from 1955-9 to 1970-4 is compared with

that from 1970-4 to 1985-7 there is some evidence that the rate of progress is accelerating in Western nations but not in the former eastern bloc states (table III).

The trends for non-amenable conditions in the age group 0-64 in both the European and North American democracies started to show improvements only in the early 1970s after a period of static rates from the 1950s. Eastern Europe also showed stagnation though with some fluctuation of trends in mortality from non-amenable causes during this early period. From about 1970, however, each eastern European country exhibited a worsening of these rates. Changes in mortality from ischaemic heart disease from 1970-4 to 1985-7 followed a pattern more typical of death rates from non-amenable causes (excluding ischaemic heart disease) in both eastern and western Europe but closer to the degree of improvement in death rates associated with amenable conditions in North America, particularly in the US.

Table IV shows five examples of categories within the amenable mortality group. Death rates from diphtheria, tetanus, and acute poliomyelitis, illustrating conditions amenable to primary prevention through the medical means of immunisation, showed appreciable falls in all countries, though from higher base values in the 1950s in central and eastern Europe. Cervical cancer, secondarily preventable through screening and early effective intervention, showed a variable pattern. Mortality from cervical cancer fell in North America, less so in western Europe and the German Democratic Republic, with little improvement in the other eastern European countries during the past 15 years. The picture is complicated by the increased recognition of the diagnosis of cervical cancer through the introduction of screening programmes, particularly if subsequent treatment has variable effectiveness in different countries. Mortality from appendicitis declined more rapidly than that for peptic ulcer but more so in both conditions in the West. The numerically important hypertensive and cerebrovascular disease category showed reductions of at least 30% in the West in each of the 15 year periods compared with relatively little change or an increase in eastern Europe.

Discussion

The data presented extend over 30 years. Difficulties in allocating conditions to amenable and non-amenable categories can occur as some conditions were less treatable by secondary prevention, say, in the 1950s than in later periods. An arbitrary decision was also taken that amenable causes would be restricted to the age group 0-64 as a maximum, though there are arguments for extending this age range. The distinction between amenable and non-amenable causes is necessarily approximate, and there will be some overlap as not all diseases designated as amenable are completely avoidable by ideal health care and the non-amenable causes are not inevitably uninfluenced by medical care. Equally, it is conceivable that individual subjects with ostensibly non-avoidable conditions are helped and have their deaths delayed by the successful treatment of some concomitant avoidable disease complicating the main condition.[14] The dichotomy between deaths from amenable and non-amenable causes used here, which is fixed for each country and the whole time period, is helpful in identifying and comparing trends but should not be carried too far. Thus at each time point, although the precise proportion of total mortality accounted for by avoidable causes may be debatable, there is little doubt that in the present state of medicine the non-amenable mortality is an important contributor to total mortality. The use of mortality as the index of health implies a negative yet a measurable and useful approach.[15] Ideally, it would have been preferable to compare countries with a positive definition of health, except that the routine measurement of such aspects of vitality and wellbeing remains elusive.

When the change in the all cause mortality in those aged 0-64 for the 15 years from 1955 to 1969 was compared with that from 1970 to 1974 a worsening or virtually static situation was evident during the second period in eastern Europe. In western countries, the improvement in the death rate in the under 65 age group did not seem merely to have delayed higher mortality until a later age as the death rates for those aged 65 and over also improved over the same three decades.

Inspection of the mortality for those aged 0-64 in

TABLE IV—*Secular changes in mortality from selected amenable causes (directly standardised per 100 000 European standard population)*

Age group (years)	Period	Hungary	Czechoslovakia*	Poland†	German Democratic Republic‡	Federal Republic of Germany	England and Wales	Canada	US
	Diphtheria, tetanus, and acute poliomyelitis								
	Rate per 100 000 1985-7	0·07	0·02	0·06	0·02	0·00	0·00	0·00	0·00
0-64	% Change 1955-9 to 1970-4	−89·6	−88·7	−95·2		−94·0	−97·8	−93·3	−96·0
	% Change 1970-4 to 1985-7	−70·8	−86·7	−50·0	−50·0	NA	NA	NA	NA
	Cervical cancer								
15-64 (females)	Rate per 100 000 1985-7	9·73	7·45	11·34	8·01	4·16	6·76	3·14	3·70
	% Change 1955-9 to 1970-4	109·9	−21·4	162·2		50·9	−13·9	−39·5	−45·6
	% Change 1970-4 to 1985-7	12·0	0·8	−12·8	−42·0	−50·2	−18·3	−53·2	−44·0
	Appendicitis								
	Rate per 100 000 1985-7	0·34	0·28	0·32	0·72	0·09	0·08	0·06	0·09
0-64	% Change 1955-9 to 1970-4	−36·4	−36·1	2·4		−64·8	−70·8	−74·7	−59·3
	% Change 1970-4 to 1985-7	−61·8	−59·4	−61·9	−36·8	−91·0	−74·2	−73·9	−72·7
	Peptic ulcer								
	Rate per 100 000 1985-7	3·57	2·68	2·75	2·71	1·02	1·57	0·76	0·74
5-64	% Change 1955-9 to 1970-4	2·2	−9·7	−11·3		−27·4	−50·3	−40·5	−50·4
	% Change 1970-4 to 1985-7	−13·6	−9·8	−28·6	−27·7	−68·2	−32·6	−63·3	−63·5
	Hypertensive and cerebrovascular disease								
	Rate per 100 000 1985-7	124·42	82·18	74·47	63·21	31·59	37·76	21·73	33·75
35-64	% Change 1955-9 to 1970-4	−8·7	19·4	10·9		−30·9	−32·2	−46·6	−48·9
	% Change 1970-4 to 1985-7	36·8	−11·9	40·7	−1·0	−39·9	−41·3	−49·7	−40·8

*Data recorded for 1985-7 are based on 1985 and 1986 data alone.
†Data recorded for 1955-9 are based on 1959 data alone.
‡Data missing for 1955-9; data recorded for 1970-4 are based on 1973 and 1974 data alone.
§Sum of the deaths in the categories and age groups in table II but excluding Hodgkin's disease.
‖Sum of deaths occurring outside the categories and age groups in table II.
¶Ischaemic heart disease during 1970-4 consists of ICD-8 codes 410-414 and during 1985-7 of ICD-9 codes 410-414.
NA=not applicable.

terms of amenable and non-amenable causes disclosed that the source of the problem for the eastern European countries lies principally, though not wholly, in non-amenable deaths. The change from 1970-4 to 1985-7 showed an increase for each eastern European country, particularly for Poland and Hungary. Over the same 15 years mortality in non-amenable conditions (including ischaemic heart disease) in the Western countries was reduced by at least 15%. This is not to say that there is cause for complacency concerning management of amenable conditions in eastern Europe. Although there were improvements in the mortality from amenable causes in the 15 years before and after 1970-4, they were substantially less than in the West.

These improvements in the western democracies were achieved in appreciably different systems of health care. The modest improvements in mortality from amenable causes achieved by the eastern European health systems, based mainly on the Soviet model, are not likely to be explained by lack of availability of doctors or hospital beds as these supply indicators have not been inferior to those in the West.[16] There has been an element of a lack of efficiency in eastern European health services compared with their western counterparts[17] and a lack of open critical debate about the quality and organisation of health services. Moreover, not only has each eastern European country had a low gross domestic product per head but recent data from the World Bank indicate that the percentage of gross domestic product spent on health care has been consistently less than in countries of the Organisation of Economic Cooperation and Development (OECD).[18] Notwithstanding, eastern European health systems have comprehensive coverage already in place and have achieved some success— for example, in always achieving high immunisation rates in children.[19] Health policy, however, seems to be changing; for example, a health insurance system with national coverage has been proposed in both Hungary and Czechoslovakia.[20] In part, one of the incentives for this type of reform, towards payment of doctors and hospitals on a fee per item of service basis, is to motivate greater health care activity. This change in the system needs to be accompanied by attention to quality control.

The non-amenable causes of death, however, seem to dominate the agenda for action in both East and West. With respect to the environment in eastern Europe, there has been neglect in implementing the effective monitoring of industrial and household emissions and effluents. Unlike in the western nations, there was little shift of emphasis, through technological change, from heavy to lighter industries. Thus, there is sulphur dioxide air pollution from the burning of lignite (brown coal) and atmospheric and water pollution with heavy metals.[21] The agenda for action on environmental safety is urgent and is being helped by a programme being administered by the European Commission, financed by western countries.[22]

With respect to personal health related behaviour, smoking is particularly high in Hungary and Poland[23] and alcohol consumption is high (>10 litres of absolute alcohol per head per year) in Hungary and the two Germanys.[24] The population in eastern Europe also has had limited access to fresh fruit and vegetables owing to the type of economic system and lack of wealth. Moreover, within former eastern bloc states the variation in mortality particularly from non-amenable causes, correlates highly with socioeconomic circum-stances.[25] Risk factors in lifestyle may also act multiplicatively with environmental pollution in producing ill-health.[26]

In the most economically developed of nations it has been emphasised that medical care is less important in a national health programme than standard of living and disease prevention.[27] This prescription for the US also applies with increased emphasis to eastern Europe— namely, that the standard of living through increased economic wealth and preventive activities and a healthier lifestyle and environmental improvement are probably more important than but do not negate the need for improved medical care.

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