

East-West mortality divide and its potential explanations: proposed research agenda

Martin Bobak, Michael Marmot

There is a sharp divide in mortality between eastern and western Europe, which has largely developed over the past three decades and is caused mainly by chronic diseases in adulthood. The difference in life expectancy at birth between the best and worst European countries in this respect is more than 10 years for both sexes. The reasons for these differences in mortality are not clear and data currently available permit only speculation. The contributions of medical care and pollution are likely to be modest; health behaviour, diet, and alcohol consumption seem to be more important; smoking seems to have the largest impact. There is also evidence that psychosocial factors are less favourable in eastern Europe. Available data show socio-economic gradients in all cause mortality within eastern European countries similar to those in the West. Determinants of the mortality gap between eastern and western Europe are probably related to the contrast in their social environments and may be similar to those underlying the social gradients in mortality within countries.

recorded an increase in male life expectancy, and even at age 45 the difference in male life expectancy between the best and worst European countries in this respect was almost eight years. The situation deteriorated further in most central and eastern European countries after the collapse of the communist regimes in 1989.^{5,6}

The World Health Organisation analysed the contribution of individual causes of death at different ages to the 6.06 year gap in life expectancy at birth between central and eastern Europe and the rest of Europe.⁷ Though there was an eightfold difference in infant mortality between the best in the west and the worst in the east, only 15% of the difference developed in infancy. Forty three per cent of the gap originated in the 35-64 year age group and 23% in the age group 65 and over (table 1). Cardiovascular diseases accounted for 54%, followed by external causes (23%) and

Department of Epidemiology and Public Health and International Centre for Health and Society, University College London Medical School, London WC1E 6BT
 Martin Bobak, research fellow
 Michael Marmot, professor of epidemiology and public health

Correspondence to: Dr Bobak.

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East-West mortality divide

There is a sharp divide in mortality between western Europe and the former socialist countries of central and eastern Europe. The difference in life expectancy between countries with the lowest and highest life expectancies at birth is more than 10 years in both men and women (figs 1 and 2). The gap in mortality has largely developed in the past two or three decades.¹⁻⁴ In all western European countries life expectancy increased substantially between 1970 and 1991 (by three to four years on average). By contrast, the increase in central and eastern Europe was at best negligible, and in Hungary, Poland, and Bulgaria there was a decline in male life expectancy at age 15 (figs 3 and 4). No central or eastern European country

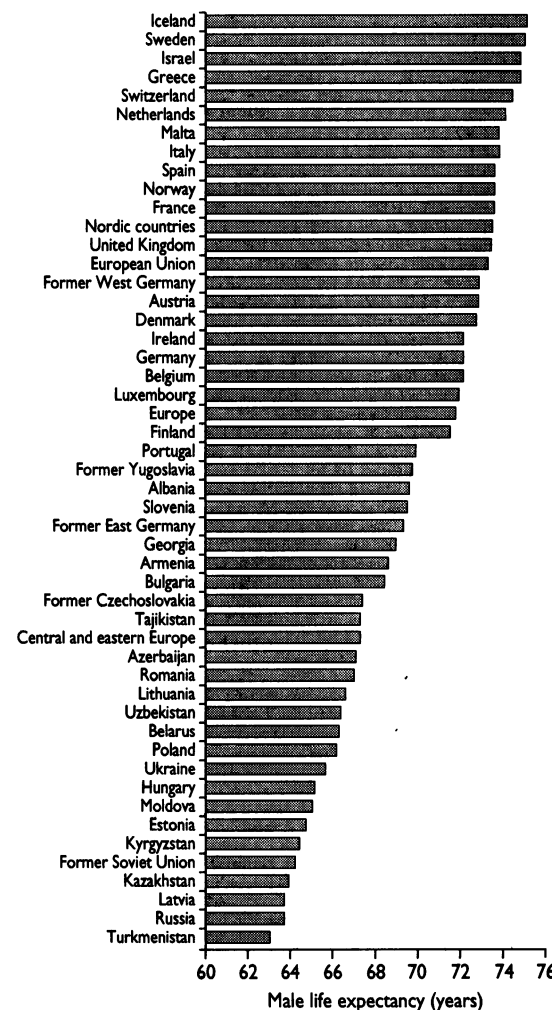


Fig 1—Male life expectancy at birth in Europe in 1991 or latest available year. (From WHO Health For All database)

Table 1—Contribution to gap in life expectancy between central and eastern Europe (including former Soviet Union) and rest of European region by age and cause of death, men and women combined, in 1992 (from WHO). Figures are difference in years between West minus East.

Cause of death	Age group (years)				All ages
	<1	1-34	35-64	≥65	
Infectious and parasitic diseases	0.30	0.10	0.08	-0.01	0.47
Cancer	0	0.05	0.25	-0.35	-0.05
Cardiovascular diseases	0	0.07	1.36	1.85	3.28
Respiratory diseases	0.68	0.20	0.15	-0.50	0.97
Digestive diseases	0.02	0.03	0.08	-0.04	0.09
External causes	0.04	0.64	0.71	0.03	1.41
Ill defined conditions	-0.10	0.01	0.04	0.18	0.12
Other diseases	0	0	-0.02	-0.20	-0.22
All causes	0.93	1.09	2.63	1.40	6.06

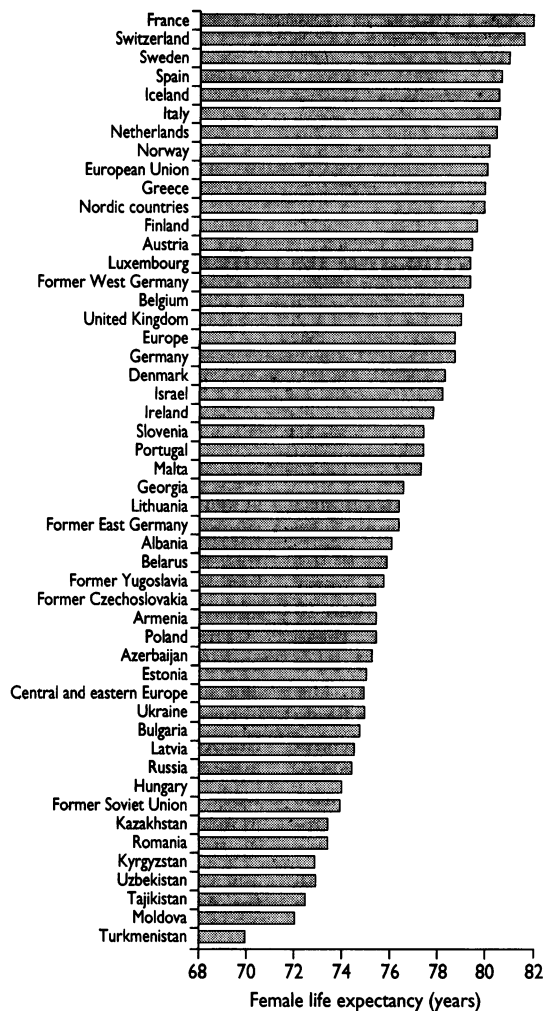


Fig 2—Female life expectancy at birth in Europe in 1991 or latest available year. (From WHO Health For All database)

respiratory diseases (16%). Separate analysis of Russian,⁸ Hungarian,⁹ and German (L Chenet *et al*, unpublished) data confirms these aggregate findings. The contribution of external causes has been higher in the former Soviet Union (table 2), particularly since the late 1980s.⁵

Potential explanations

Several explanations for the mortality differences in Europe have been put forward. The main problem is lack of reliable and representative data in central and eastern Europe and, to some extent, western Europe. A Medline search identified 1262 papers on mortality in eastern Europe published since 1983. Though most described the problem, only a handful dealt with some of the potential causes of the gap and only one listed several potential causes.² We draw on these papers and other data.

QUALITY OF MEDICAL CARE

One approach to assessing the contribution of medical care is to classify causes of death into amenable and not amenable to medical intervention.¹⁰ Figure 5 shows that differences in mortality between central European countries and former West Germany are larger for all causes of death (including those amenable to medical intervention) than for causes not amenable to medical intervention.¹¹ Differences in all cause mortality would be reduced by some 20% if causes of death amenable to medical intervention occurred at the same rate in all countries. However, causes of death amenable to medical intervention include diseases whose avoidability is questionable, most notably hypertensive and cerebrovascular diseases. When these diseases are excluded the mortality excess possibly attributable to medical care falls to less than 10%. This 10% is probably a maximum because differences in conditions amenable to medical intervention may be due to their rate of occurrence as well as their treatment. Moreover, coronary heart disease (the main contributor to the gap) is believed not to be amenable to medical care.^{12 13}

ENVIRONMENTAL POLLUTION

Air pollution has often been implicated in the poor health of people in central and eastern Europe because it affects large populations and its adverse effects are generally accepted. Studies in several central European countries found that air pollution is related to increased mortality.¹⁴⁻¹⁸ The most polluted area of Europe is the

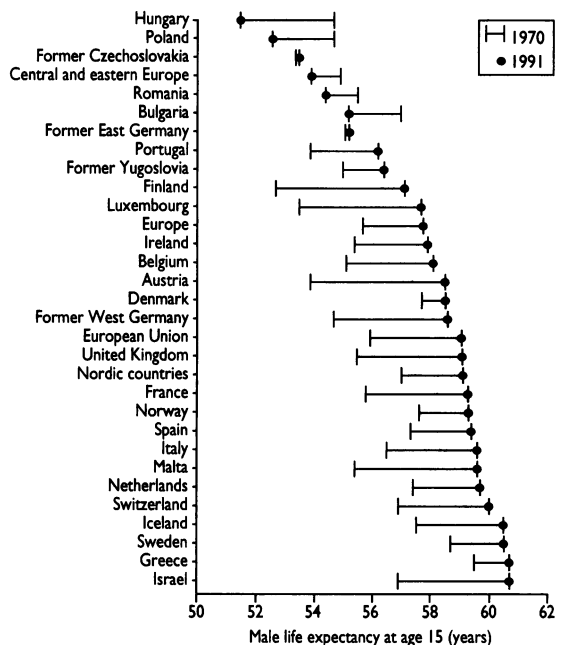


Fig 3—Male life expectancy at age 15 in Europe in 1970 and 1991 or latest available year. (From WHO Health For All database)

Table 2—Age standardised death rates (per 100 000) by sex from all causes, external causes, and cirrhosis in Europe in 1991-2. Source: WHO Health for All database

Region	All causes		External causes		Traffic accidents		Suicide		Homicide		Cirrhosis	
	M	F	M	F	M	F	M	F	M	F	M	F
Central and eastern Europe	1464	875	122	39	26	7	30	8	4	2	39	14
European Union	1013	597	69	29	22	7	18	6	2	1	24	10
Nordic countries	1004	603	87	35	13	6	29	11	2	1	12	5
Russia	1787	905	260	61	41	10	56	11	36	10	20	8
All Europe	1114	659	83	31	22	7	21	7	3	1	27	11

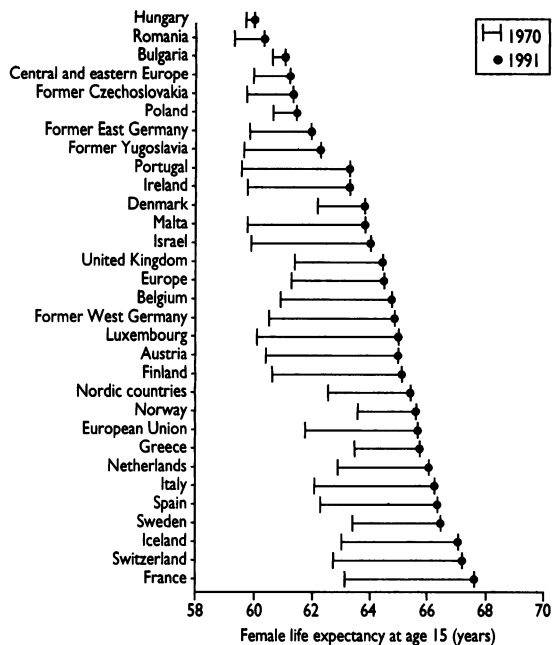


Fig 4—Female life expectancy at age 15 in Europe in 1970 and 1991 or latest available year. (From WHO Health For All database)

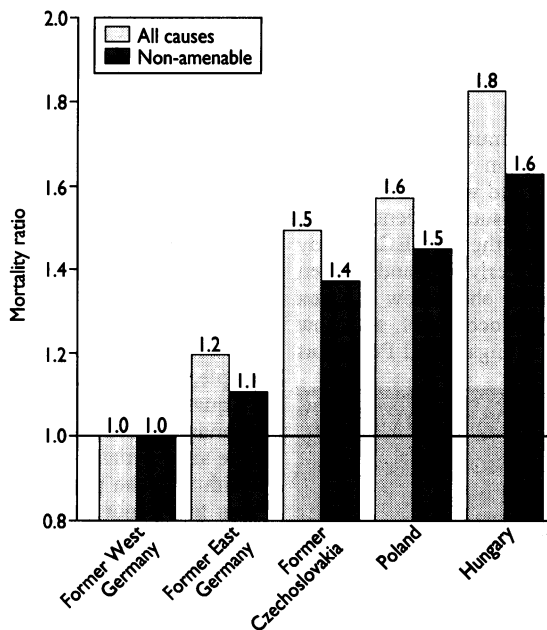


Fig 5—Mortality from all causes and causes not amenable to medical care relative to former West Germany, 1985-7. Data for both sexes, age range 0-64. (From Boys et al¹¹)

“black triangle,” which covers neighbouring parts of the Czech Republic, Poland, and former East Germany. Until recently air pollution there was high even by east European standards, with levels of particulates and sulphur dioxide exceeding two to three times the WHO air quality guidelines.³

The impact of air pollution on all cause mortality in the Czech Republic was estimated by combining the proportion of the population exposed to known levels of pollution and the dose-response function documented elsewhere.¹⁹⁻²² This approach suggests that an estimated 2-3% of total mortality could be attributed to air pollution in the Czech Republic in 1987, which would account for 9% of the difference between the Czech Republic and Austria or former West Germany.¹⁹ Similar results were obtained by Jakubowski for Upper Silesia.²³ As these are estimates for the Czech Republic and Poland, the most polluted countries in the region, the impact in other countries is likely to be smaller.

It is difficult to estimate the effect of other pollutants. Firstly, the relation between pollutants and mortality is either controversial or at best poorly quantified²⁴; secondly, levels of population exposure in central and eastern Europe are not known. Some cancers are among the causes of death most likely to be affected by environmental pollution, though the impact is probably modest. Doll and Peto estimated that some 2% of all cancers in the United States could be attributed to environmental pollution, including air pollution²⁵; the impact in eastern Europe is probably not dramatically higher. Neoplasms, apart from smoking related cancers,²⁶ do not contribute much to the East-West mortality differences (table 1), and probably the role of pollutants other than air pollution in the high mortality in the region is small.²⁴

SOCIOECONOMIC FORCES

When the world scene is considered as a whole, life expectancy increases with wealth²⁰ but above a threshold of income the relation is with distribution of income rather than levels.²⁷ This has led to speculation that there are two broad classes of factors that account for the relation between income and mortality: material deprivation and psychosocial factors. Gross domestic product is considerably lower in eastern Europe than in the West, and the shorter life expectancy in eastern Europe is consistent with that predicted from the lower income.²⁸ This shorter life expectancy is made up of infant death rates that are better than predicted from national income and adult death rates that are worse.²⁸ Infant death rates have usually been taken as a sensitive indicator of material deprivation. Hence this relatively good record leads to speculation that the poor socioeconomic situation in eastern Europe is important in generating high adult mortality but that its effect is mediated by psychosocial factors rather than absolute deprivation.

This raises potentially important measurement problems.²⁹ In general, measures of socioeconomic influences have relied on income, education, and occupational prestige. If psychosocial factors are important it is unlikely that these measures will have the same meaning in eastern Europe as in the West. That they are important, however, is shown by the inverse social gradient in mortality in central and eastern Europe, which is similar to that in western Europe (table 3).³⁰

There are socioeconomic variations in health within central and eastern Europe, as in western Europe, and there are differences in health and socioeconomic factors between eastern and western Europe. We speculate that socioeconomic variation within countries and East-West differences may be related. A test requires appropriate conceptualisation and measurement of socioeconomic factors.

Factors which may mediate the effect of social and economic forces include lifestyle (smoking, exercise), diet, alcohol, and possibly psychosocial stress.

Lifestyle

Smoking, lack of physical activity, and obesity have been shown to be risk factors for several chronic

Table 3—Mortality/1000 from all causes by education in Wroclaw, Poland, 1988-9 among people aged 50-64. (From Brajczewski and Rogucka³⁰)

	Education		
	University	Secondary	Primary
Men	9.4	15.2	21.1
Women	5.0	7.3	8.9

diseases. Data from 35 MONICA centres showed that international differences in coronary heart disease incidence and mortality could not be explained by concurrent differences in smoking, though the correlation with all cause mortality was higher.³¹ Possibly the contribution of smoking would have been greater had it been feasible to take into account lifetime smoking. This may underlie the approach of Peto *et al*, who used lung cancer mortality to estimate smoking prevalence.³² If we use this approach about half of the excess mortality in central and eastern Europe could be explained by smoking. This is probably an overestimate, as this approach has been criticised.³³ Nevertheless, smoking probably has an important role.^{34,35} The question then arises, why is the prevalence of smoking in central and eastern Europe so high? Might it relate to the social circumstances of those regions?

Diet

Two diet related factors—fats and antioxidants—are the most interesting with respect to international differences in mortality. Consumption of saturated fats, through their effects on plasma lipids, increases the risk of cardiovascular disease. However, consumption of “animal fat” reported to the UN Food and Agricultural Organisation by member states does not show dramatic differences between eastern and western Europe. Similarly, plasma cholesterol concentrations recorded in MONICA centres do not show a large variation between central and eastern Europe and western Europe.³⁶

More recently there has been much interest in the role of antioxidant vitamins in atherosclerosis.³⁷ Representative data for eastern and western European populations are not available but such evidence as we have is consistent. Results from the SENECA study conducted in small samples of elderly men and women in several European countries show low plasma concentrations of retinol and tocopherol and low dietary intake of vitamin C in Hungary and Poland as

compared with western European populations.³⁸ Ecological analysis of data collected by the MONICA project explained a high proportion of the variation in coronary heart disease mortality by antioxidant vitamins.³⁹ A small study in the Czech Republic found low mean plasma concentrations of β carotene and α tocopherol, and low concentrations were associated with increased risk of myocardial infarction (M Bobak *et al*, unpublished).

Alcohol

It is generally perceived that alcohol consumption is higher in eastern Europe, though this is not supported by international data, probably because of the underestimation of home produced beverages.⁴⁰ Comparison of alcohol consumption between former East and West Germany also showed negligible differences.⁴¹ However, death rates from cirrhosis (table 2) are 75% higher in central and eastern Europe than in the European Union. The rather low rates in Russia may be due to differences in the coding of causes of death. Higher consumption of alcohol would almost certainly influence mortality from accidents and injuries. These causes are higher in the East than in the West (table 2) and account for almost 25% of the gap in life expectancy (table 1).

Psychosocial stress

Shortages of food and other daily needs, unfulfilling work, little or no reward for effort at work, low control over lifestyle, and feelings of disadvantage relative to western Europe have been common in central and eastern Europe. Many studies have linked these psychological factors to poor health, particularly cardiovascular disease. Psychosocial factors may therefore contribute to the high death rates in central and eastern Europe.

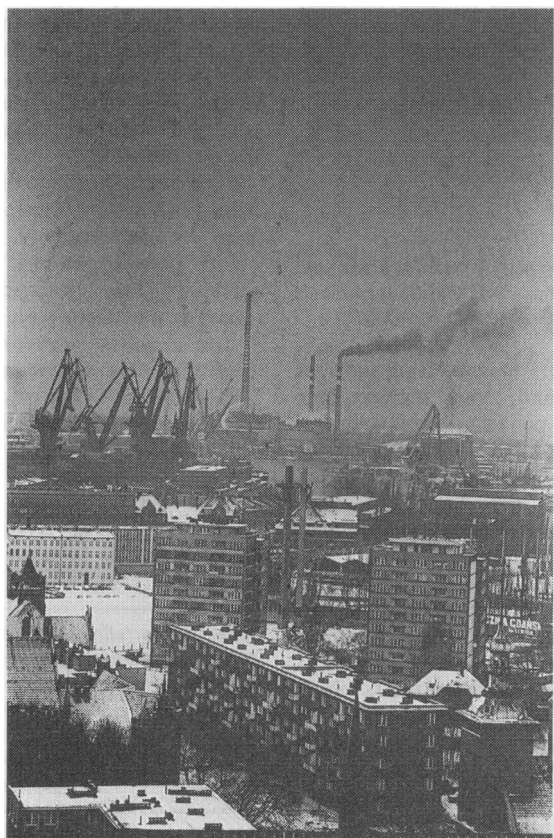
As with other potential explanations, there is little direct support for this hypothesis. However, there are exceptions. Most of the increase in all cause mortality in Hungary during the 1980s occurred in unmarried people,⁴² who may have less social support and less adequate social relationships than married people. The Kaunas-Rotterdam study found that Lithuanian men were substantially less optimistic with respect to their health and the possibility of influencing their health. This factor not only strongly predicted mortality at follow up but also (statistically) explained the 30% excess in all cause mortality in Kaunas.⁴³

People in central and eastern Europe perceive their health as worse than that of people in the West—for example, fewer than 20% of Czech men and women aged 55-64 rate their health as good or very good as compared with around 80% of people in Switzerland.⁷ The Czech study found that decision latitude at work and the pace of work were strongly related to the risk of myocardial infarction independently of other factors and that the number of social relationships was inversely related to myocardial infarction. These examples suggest that psychosocial factors may play a part in the poor health record of central and eastern Europe. This may be a direct effect and may also be mediated by consumption of alcohol, smoking, unhealthy diet, and violent behaviour.

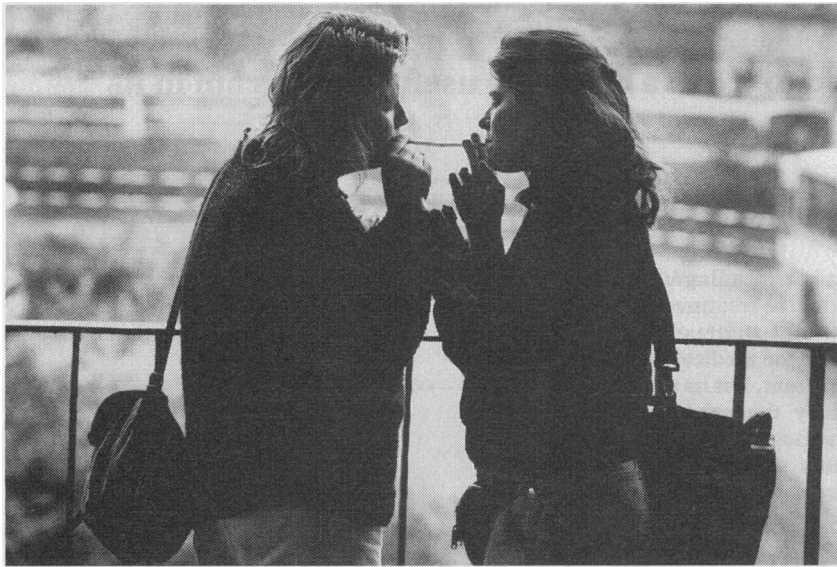
Conclusion

There is no simple explanation for the East-West mortality gap. Firm conclusions are rendered impossible by the lack of representative and valid data. In discussing potential causes we therefore lay out a research agenda.

The picture in eastern Europe since the 1960s^{3,4} of high death rates from coronary heart disease and violent causes and low self rated health suggests



Pollution in eastern Europe probably contributes only modestly to shorter life expectancy



Why should smoking be so common in central and eastern Europe and the consumption of fresh fruit and vegetables be so low?

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societies with serious social problems. The failure of the political and economic system to satisfy population needs, both material and psychosocial, is probably the cause. The finding in central and eastern Europe of a social gradient in mortality similar to that observed consistently in Western countries suggests the operation of powerful social and economic forces in determining the unfavourable mortality in the East. The question is how these operate.

Environmental pollution and medical care could have contributed as much as 20% to the gap, though we believe that the contribution is probably less. Lifestyle, behaviour, and diet are probably more important, though the precise magnitude of their effect is difficult to quantify; among them, smoking seems to have the largest identifiable impact. However, there are other forces behind lifestyles. The frequency and distribution of lifestyle factors are largely determined by social factors such as education, real income, access to information, or availability of goods.

Why should smoking be so common in central and eastern Europe and the consumption of fresh fruit and vegetables be so low? The feeling of little control over health, external locus of control, has been documented in central and eastern Europe.⁴³ Lack of control over health may be related to a wider sense of lack of control and mastery, which in turn may be related to the social situation. This may be one mode of action of psychosocial factors. They may also act directly through neuroendocrine pathways (stress) and may play an important part in the difficult health picture described.

Changes in these societies will be driven by concerns other than health. However, the fact that a 15 year old boy in Hungary can expect to live to 67 on average while one in Israel or Iceland can expect to live to 77 cannot be ignored. Research to inform policy on the determinants of these differences is urgently needed.

Except where stated otherwise, data were taken from the WHO Health for All database.

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