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The East-West Life Expectancy Gap: Differences in Mortality from Conditions Amenable to Medical Intervention

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Background. Although mortality from conditions amenable to medical intervention has frequently been shown to be higher in the countries of Central and Eastern Europe (CCEE) than in the countries of Western Europe (CWE), the contribution of these mortality differences to the East-West gap in life expectancy is unknown. We have determined the contribution of mortality from nine amenable causes to differences in temporary life expectancy from birth to age 75 (TLE_{0-75}) between 12 CCEE and the average TLE_{0-75} for CWE in ca. 1988.

Data and methods. Population and mortality data were extracted from publications of the World Health Organization. Chiang's method was used for constructing abridged life tables, and Arriaga's method was used for decomposition by cause of death of the differences in TLE_{0-75} between each of the CCEE and the average for CWE.

Results. Differences in TLE_{0-75} between CCEE and the average for CWE ranged between 1.25 and 6.29 years in men, and between 1.09 and 3.44 years in women. After exclusion of early neonatal deaths, for which data were not available in all CCEE, amenable causes accounted for between 11% and 50% of the difference in TLE_{0-75} in men, and between 24% and 59% in women. The results for countries where data on early neonatal deaths were available show that inclusion of this category generally raises these estimates substantially. The contribution of conditions amenable to medical intervention to the East-West life expectancy gap is of the same order of magnitude as that of cardiovascular diseases, and much larger than that of neoplasms, respiratory diseases or external causes.

Conclusion. Although the contribution of conditions amenable to medical intervention should not be taken as a direct estimate of the contribution of medical care to the East-West life expectancy gap, these results suggest that reducing differences in the effectiveness of medical care may be more important for narrowing the life expectancy gap than has hitherto been assumed.

Keywords: mortality, life expectancy, amenable conditions

There is a wide gap in life expectancy between the countries of Central and Eastern Europe (CCEE) and the countries of Western Europe (CWE). Around 1990, male life expectancy at birth in Central and Eastern Europe as a whole was almost 7 years shorter than in Western Europe, while female life expectancy was 5 years shorter. This is largely the result of diverging mortality trends in the most recent decades. During the 1950s and 1960s, life expectancy in CCEE rapidly caught up with that in CWE, due to the fact that mortality rates declined more rapidly in CCEE than in CWE. During the 1970s and 1980s, however, mortality rates in CCEE remained stagnant or increased, while they declined substantially in CWE. Since 1990 the divergence has become even larger.[1–4]

Several attempts have been made to investigate the causes of this gap in life expectancy. Most observers agree that it is likely that the higher mortality rates in CCEE are the result of a complex interaction between various factors, including unfavourable socioeconomic circumstances, a high frequency of health-damaging behaviour, environmental pollution and lack of effectiveness of medical care.[3–8] It is as yet unclear what the relative contribution of each of these factors is.

In this paper, we will focus on the contribution of medical care. It is impossible to measure this contribution directly, but cause-of-death patterns do provide evidence of a relative lack of effectiveness of the medical care systems in CCEE. Like other researchers

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TABLE 1 *Countries and periods used in the study*

Countries of Central and Eastern Europe (CCEE)	Data available for:
Belarus	1987–1990
Bulgaria	1985–1991
Czechoslovakia	1985–1991
German Democratic Republic	1985–1989
Hungary	1985–1991
Latvia	1988–1990
Lithuania	1988–1990
Poland	1986–1991
Romania	1985–1991
Russian Federation	1988–1991
Ukraine	1987–1990
Yugoslavia	1986–1990
Countries of Western Europe (CWE)	**Data available for:**
Austria	1985–1991
Belgium	1985–1989
Denmark	1985–1991
Federal Germany	1985–1990
Finland	1985–1991
France	1985–1991
Greece	1985–1991
Ireland	1985–1991
Italy	1985–1990
Netherlands	1985–1991
Norway	1985–1991
Portugal	1985–1991
Spain	1985–1990
Sweden	1985–1990
Switzerland	1985–1991
United Kingdom	1987–1990

before us, we will use Rutstein's lists of conditions considered to be amenable to medical intervention[9–11] as the basis for a comparative analysis of the effectiveness of medical care in CCEE and CWE. Previous research has already shown that levels of mortality from these amenable conditions are much higher in CCEE than in CWE, which suggests that medical care is less effective in the East than in the West.[12–16]

Unlike others, however, we will not stop at the calculation of' differences between CCEE and CWE in mortality rates for these conditions, but try to determine what the contribution of these differences in mortality is to the East-West gap in life expectancy. Other researchers before us have generally concluded that, because of the low absolute levels of mortality from these conditions, this contribution is likely to be small.[12] We set out to determine whether this is true.

The specific objectives of our study were: (i) to describe the differences in mortality from conditions amenable to medical intervention between CCEE and CWE; (ii) to estimate the contribution of these differences in mortality to the difference in life expectancy between CCEE and CWE; (iii) to compare this contribution with that of the differences in mortality from the four major cause-of-death groups (cancer, cardiovascular diseases, respiratory diseases, external causes).

DATA AND METHODS

Data Sources

Numbers of deaths by underlying cause, age group (<1, 1–4, 5–14, ..., 75+) and sex were extracted from the World Health Statistics Annuals of the World Health Organization.[17] We used the data available for 12 CCEE and 16 CWE for 4–7 years in the period 1985–1991 (Table 1). Population numbers by age group and sex were obtained from the same source. Approximate person-years at risk for the deaths occurring in a given period were calculated by averaging the population numbers of the period.

Selection of Causes of Death

We selected a number of causes of death from Rutstein *et al.*'s lists of 'unnecessary untimely deaths'.[9,10] As others have done before us we excluded from the study very infrequent causes of death, and also some conditions for which the control depends mainly on prevention and for which effective interventions mainly take place outside the medical care system (e.g. lung cancer, motor vehicle accidents). [18,19] We were restricted in the selection of amenable causes of death because of limited data availability in the source we used (no data on Hodgkin's disease, cholelithiasis and -cystitis, asthma).

The analysis included ten causes considered to be amenable to medical intervention and four major cause-of-death groups representing the leading causes of death in the developed world (Table 2). As the avoidability of both acute respiratory diseases and pneumonia is mainly based on antibiotic treatment they were treated in the analysis as a combined category 'acute diseases of the respiratory system'. In order to eliminate any differences in coding practices for hypertension and cerebrovascular disease the data for these two causes were also combined in a broad category. Maternal mortality consists of all direct causes of death related to pregnancy, delivery and puerperium, expressed per 100 000 live births. No data were available on stillbirths in many of the studied countries, and we could therefore not calculate perinatal mortality. Instead, we used early neonatal mortality (all deaths in

TABLE 2 *Conditions, amenable to medical intervention, age group 0–75 in Countries of Central and Eastern Europe (CCEE) and Countries of Western Europe (CWE)*

Causes of death	ICD-9	Average age-standardized death rates (per 100 000 person-years)			
		Male		Female	
		CCEE	CWE	CCEE	CWE
Amenable:					
Tuberculosis	010–018, 137	11.44	1.43	1.56	0.39
Chronic rheumatic heart disease	393–398	5.53	1.38	6.01	2.09
Pneumonia and other acute respiratory diseases	480–483, 485–486, 460–466	38.30	7.23	15.29	3.73
Appendicitis	540–543	0.70	0.16	0.34	0.08
Hernia abdominalis	550–553	1.97	1.12	1.50	0.74
Hypertension and cerebrovascular disease	401–405, 430–438	118.07	41.52	82.79	26.87
Cervical cancer	180			6.87	2.84
Maternal mortality[a]	630–678			33.22	6.28
Early neonatal deaths[b]	All	8.82	4.15	6.49	3.04
Large:					
Neoplasms	140–208	224.67	185.25	110.62	103.40
Cardiovascular diseases	390–459	402.02	203.70	207.27	86.85
Respiratory diseases	460–519	85.99	33.68	29.45	12.97
External causes	E800–999	99.92	39.77	23.98	12.75
All causes	All	976.49	589.03	451.83	284.98

[a] Per 100 000 live births.
[b] Per 1000 births.

the first week after birth, regardless of the underlying cause), where available.

For the cause-specific mortality analyses an age limit of 75 was set because avoidability of death and reliability of cause-of-death certification become increasingly questionable at older ages.

Methods of Analysis

Age-adjusted mortality rates by sex were calculated for all conditions using the direct standardization method and the European Standard Population.[20] Aggregated measures of mortality for all CCEE and all CWE were computed by averaging the unweighted rates of mortality for each country. Relative risks of mortality from causes amenable to medical intervention in CCEE were expressed on the basis of a comparison to the aggregated mortality level of all CWE.

Because of the age limit referred to above, we did not use life expectancy at birth but temporary life expectancy (TLE) from birth to age 75 for the calculation of the contributions of specific causes of death. This is defined as the average number of years that a cohort of newly-born infants would live between birth and the age of 75, if these individuals would during their life time be subjected to the age-specific mortality risks observed in a given period of time. It is calculated as:

$$TLE_{0-75} = (T_0 - T_{75})/1_0,$$

where T_0 and T_{75} are the total number of person-years lived beyond the exact ages of 0 and 75, respectively, and 1_0, is the number of newborns in the cohort for which the life table is constructed.

In order to calculate TLE_{0-75} we constructed abridged life tables by sex for each country according to the classical method of Chiang.[21]

We applied the method described by Arriaga for decomposition by cause of death of the differences in TLE_{0-75} between the average for CWE and each of CCEE.[22,23] First, we calculated the differences in

age specific mortality rates for the conditions under study. The contribution of these conditions to the differences in $TLE_{0–75}$ was then estimated under the assumption that the contribution in each age group is proportional to the contribution to the difference of the total central mortality rate made by the mortality difference for each cause of death in that age group.

RESULTS

The differences in mortality from conditions amenable to medical intervention for both genders were examined by comparison of age-standardized death rates for each CCEE and aggregated rates for CWE. For all amenable causes of death the observed levels were higher in almost all CCEE. Table 3 presents the relative risks (RR) of amenable mortality (age-adjusted) by sex using the aggregated rates of CWE as a reference. The range of variation inside Western Europe is also shown in this Table. The highest RR are found for maternal mortality in Romania (RR = 24.2), for tuberculosis among men in Lithuania (RR = 1 1.), the Russian Federation (RR = 10.9) and Ukraine (RR = 10.9), and for acute respiratory diseases among men in the Russian Federation (RR = 10.2). For many causes of death and many CCEE RR are above 2, indicating substantial excess mortality as compared with the average for CWE. Important exceptions among the causes of death are acute respiratory diseases, hernia abdominalis and early neonatal deaths, where RR for CCEE generally are below 2. An exception among the countries is the former German Democratic Republic, for which most RR are also below 2. Inside Western Europe some countries also have levels of mortality more than 2 times higher than the average for CWE, which shows that the divisions are not as sharp as might have been expected.

Table 4 shows life expectancy at birth and $TLE_{0–75}$ in the individual CCEE and the average for CWE for both genders. The life expectancies of CWE are among the highest in the world, however, there are significant variations even among them. A female in Western Europe can expect to live on the average almost 80 years, or 7.41 years longer than a male, for whom we calculated the average life expectancy at birth to be 72 years. Life expectancy at birth for men ranged from 70 years in Portugal to 74 years in Sweden. Most favourable were the life prospects for women in Switzerland (82 years) and the lowest level belonged to the Italian women who at ca. 1988 mortality levels can expect to live 76 years at birth. In CCEE the life expectancy at birth for men was below 70 years. ranging from 69.7 in former GDR to 63.5 in Lithuania. The figures computed for women in CCEE showed that their life expectancy clearly surpassed that of the men, as in CWE but more so. When the $TLE_{0–75}$ was calculated instead of life ex pectancy at birth, the relative position of the particular CCEE was in general maintained. The biggest differences with CWE in both life expectancy at birth and $TLE_{0–75}$ were found for men in Lithuania, the Russian Federation, and Latvia, and for women in Romania, Hungary and the Russian Federation

The contribution to the differences with CWE in $TLE_{0–75}$ of the nine amenable causes of death is presented in Table 5 If the mortality levels of the selected amenable causes were reduced to the aggregated levels of CWE, life expectancy from birth to the age of 75 of men and women in CCEE would increase by between a third of a year (former GDR, men and women) and almost 2 years (Romania, men and women). We were not able to calculate the contribution of early neonatal deaths to the difference with CWE for all of CCEE because of lack of information for the former Soviet republics Only seven countries were included in the comparison after the addition of early neonatal deaths (Table 5). The addition of early neonatal deaths sometimes leads to a large increase in the contribution of amenable causes to the East-West gap in $TLE_{0–75}$, especially for Hungary, Poland and the former Yugoslavia where the RR for this cause were particularly high (cf. Table 3).

The contribution of individual amenable causes of death to the difference in $TLE_{0–75}$ is demonstrated with examples of two countries—Poland and the Russian Federation (Table 6). It is evident that in Poland both genders would add more than half a year to their $TLE_{0–75}$ if mortality from hypertension and cerebrovascular disease as well as early neonatal mortality were reduced to the aggregated level of CWE For the Russian Federation. hypertension and cerebrovascular disease alone accounts for more than half a year difference in $TLE_{0–75}$ Acute diseases of the respiratory system and tuberculosis are also of great importance for the gap in life expectancy between Russia, especially Russian males, and the West.

Table 7 describes the contribution of the four leading cause-of-death groups to the differences in $TLE_{0–75}$ As expected, for both genders, the major contribution comes from cardiovascular diseases, where reduction of mortality to the aggregated level of CWE would add one year on the average for females and 1.5 years for males in CCEE. Malignant neoplasms also are important, especially for the former Czechoslovakia, Hungary' Lithuania and the Russian Federation External causes of death are the second source of $TLE_{0–75}$ differences for men between the former Soviet republics and CWE. and give rise to one-third of the existing differences.

TABLE 3 *Relative risks of mortality from amenable causes in Countries of Central and Eastern Europe (CCEE) as compared to Countries of Western Europe (CWE), ca. 1988 (age-standardized, European Standard Population, age-group 0–75 years)*

Male		TUB	CHR	ACRES	APP	HER	HYP			END
Country										
Belarus		5.13	6.42	1.25	4.62	1.12	2.45			n.d.a
Bulgaria		2.50	3.28	4.59	1.81	1.31	3.59			1.53
Czechoslovakia		1.21	4.00	2.79	3.17	1.67	2.44			1.73
GDR		1.15	2.36	1.60	8.59	1.83	1.87			0.78
Hungary		4.58	4.28	1.18	3.67	1.66	3.20			2.76
Latvia		8.27	4.84	1.32	4.62	0.99	2.97			n.d.a.
Lithuania		11.10	8.59	1.24	7.07	1.21	2.48			n.d.a.
Poland		4.29	5.27	1.64	3.16	1.81	1.62			2.62
Romania		7.04	3.91	5.73	3.57	2.36	3.38			1.33
Russian Fed.		10.90	4.06	10.24	5.43	1.89	3.40			n.d.a.
Ukraine		10.92	4.08	1.31	4.43	1.17	2.73			n.d.a.
Yugoslavia		4.89	1.36	1.90	1.88	1.98	2.17			3.10
CCEE		7.96	4.00	5.29	4.50	1.75	2.84			2.13[a]
CWE		1.00	1.00	1.00	1.00	1.00	1.00			1.00
Range CWE	min	0.24	0.14	0.54	0.16	0.26	0.66			0.77
	max	3.30	1.50	2.24	2.24	1.65	2.32			2.10
Female		**TUB**	**CHR**	**ACRES**	**APP**	**HER**	**HYP**	**CERV**	**MAT**	**END**
Country										
Belarus		2.99	3.91	1.30	4.90	1.05	2.72	1.83	3.69	n.d.a
Bulgaria		2.05	2.53	4.88	1.59	1.14	3.82	1.64	2.52	1.44
Czechoslovakia		1.48	2.40	2.68	3.49	1.99	2.38	2.34	1.47	1.76
GDR		1.47	1.58	1.67	6.39	2.74	2.15	2.51	1.50	0.74
Hungary		3.61	2.91	1.18	4.06	2.63	3.12	2.91	2.76	2.98
Latvia		4.95	3.46	1.04	7.33	1.47	2.96	1.90	5.63	n.d.a.
Lithuania		4.82	3.47	0.76	4.18	1.26	1.85	2.85	3.48	n.d.a.
Poland		3.10	3.51	1.68	3.22	2.27	1.79	3.38	2.02	2.64
Romania		4.02	3.33	7.35	4.67	2.93	4.04	4.38	24.19	1.16
Russian Fed.		4.28	3.13	6.29	4.86	2.03	3.52	2.08	8.18	n.d.a.
Ukraine		5.11	2.74	1.31	4.32	1.50	2.97	2.40	5.49	n.d.a.
Yugoslavia		5.72	0.93	2.59	1.84	2.07	2.59	1.75	2.17	3.26
CCEE		4.00	2.88	2.42	4.10	4.35	2.01	2.42	5.60	2.13[a]
CWE		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Range CWE	min	0.46	0.16	0.55	0.40	0.25	0.61	0.35	0.66	0.84
	max	2.29	1.66	5.97	2.03	1.59	2.21	2.28	1.64	2.15

[a] CCEE average for seven countries.

TUB = tuberculosis
CHR = chronic rheumatic heart disease
ACRES = pneumonia and other acute respiratory diseases
APP = appendicitis
HER = hernia abdominalis
HYP = hypertension and cerebrovascular disease
CERV = cervical cancer
MAT = maternal mortality
END = early neonatal deaths
n.d.a. = no data available

TABLE 4 *Life expectancy at birth (LE) and temporary life expectancy from birth to age 75 (TLE_{0-75}) in Countries of Central and Eastern Europe (CCEE) and Countries of Western Europe (CWE), ca. 1988*

Male		LE	Differences to CWE	TLE_{0-75}	Differences to CWE
Country					
Belarus		66.48	6.06	63.32	4.44
Bulgaria		68.33	4.21	65.08	2.68
Czechoslovakia		67.56	4.98	64.83	2.93
GDR		69.66	2.88	66.51	1.25
Hungary		65.38	7.16	62.85	4.91
Latvia		65.25	7.29	62.58	5.18
Lithuania		63.47	9.07	61.09	6.67
Poland		66.71	5.83	63.83	3.93
Romania		66.64	5.90	63.38	4.38
Russian Fed.		64.02	8.52	61.47	6.29
Ukraine		66.27	6.27	63.30	4.46
Yugoslavia		69.00	3.54	65.22	2.54
CCEE		65.77	6.77	62.94	4.82
CWE		72.54		67.76	
Range CWE	min	70.44		66.08	
	max	74.51		68.57	
Female		**LE**	**Differences to CWE**	**TLE_{0-75}**	**Differences to CWE**
Country					
Belarus		76.45	3.50	69.52	1.62
Bulgaria		74.89	5.06	69.32	1.82
Czechoslovakia		75.51	4.44	69.65	1.49
GDR		75.87	4.08	70.05	1.09
Hungary		73.94	6.01	68.35	2.79
Latvia		75.11	4.84	69.00	2.14
Lithuania		76.66	3.29	69.51	1.63
Poland		75.74	4.21	69.35	1.79
Romania		72.94	7.01	67.70	3.44
Russian Fed.		74.76	5.19	68.54	2.60
Ukraine		75.38	4.57	69.06	2.08
Yugoslavia		75.33	4.62	68.93	2.21
CCEE		74.99	4.96	68.84	2.30
CWE		79.95		71.14	
Range CWE	min	76.00		70.56	
	max	82.00		71.61	

DISCUSSION

In the analysis reported above we found relatively high levels of mortality from causes amenable to medical intervention in CCEE as compared to CWE Although amenable causes of death did not appear to be the major contributor to the difference in TLE_{0-75} between CCEE and CWE, decreasing their levels to those experienced by West European populations could add about one year to TLE_{0-75} in CCEE, both for men and for women. This is more than we expected on the basis of previous reports, which have argued that the possible contribution of medical care to the East-West life expectancy gap is likely to be small.[12] Part of the difference with previous studies may be explained by the fact that most

TABLE 5 *Total contribution of causes amenable to medical intervention to the differences in temporary life expectancy between Countries of Central and Eastern Europe (CCEE) and Countries of Western Europe (CWE)*

Male	Total differences in TLE_{0-75} (yrs)	Total differences due to amenable causes (yrs)		% of the total difference due to amenable causes	
		excl. END	incl. END	excl. END	incl. END
Country					
Belarus	4.44	0.81	n.d.a.	18.22	n.d.a.
Bulgaria	2.68	1.33	1.47	49.88	55.06
Czechoslovakia	2.93	0.60	0.79	20.36	27.02
GDR	1.25	0.32	0.31	25.49	25.35
Hungary	4.91	0.82	1.31	16.69	26.61
Latvia	5.18	0.77	n.d.a.	14.80	n.d.a.
Lithuania	6.67	0.74	n.d.a.	11.19	n.d.a.
Poland	3.93	0.46	0.90	11.67	22.98
Romania	4.38	1.88	1.96	42.99	44.83
Russian Fed.	6.29	1.57	n.d.a.	24.96	n.d.a.
Ukraine	4.46	0.88	n.d.a.	19.75	n.d.a.
Yugoslavia	2.54	0.65	1.23	25.74	48.76
CCEE	4.82	1.15	n.d.a.	23.81	n.d.a.
Female	**Total differences in TLE_{0-75} (yrs)**	**Total differences due to amenable causes (yrs)**		**% of the total difference due to amenable causes**	
		excl. END	incl. END	excl. END	incl. END
Country					
Belarus	1.62	0.66	n.d.a.	40.59	n.d.a.
Bulgaria	1.82	1.06	1.15	58.74	63.59
Czechoslovakia	1.49	0.49	0.64	32.62	43.13
GDR	1.09	0.35	0.28	32.15	25.72
Hungary	2.79	0.69	1.12	24.83	40.00
Latvia	2.14	0.60	n.d.a.	27.83	n.d.a.
Lithuania	1.63	0.39	n.d.a.	24.15	n.d.a.
Poland	1.79	0.48	0.83	27.10	46.46
Romania	3.44	1.85	1.88	53.96	54.71
Russian Fed.	2.60	1.10	n.d.a.	42.46	n.d.a.
Ukraine	2.08	0.70	n.d.a.	33.78	n.d.a.
Yugoslavia	2.21	0.65	1.14	29.61	51.71
CCEE	2.30	0.91	n.d.a.	39.39	n.d.a.

END = early neonatal deaths.
n.d.a. = no data available.

of these were based on an arbitrary upper age limit of amenability of 64, whereas we have applied an age limit of 74. This is likely to have increased the share of hypertensive and cerebrovascular disease. More important, however, is the fact that we have directly calculated the contribution of amenable causes to the East-West gap in life expectancy. Although the amenable causes selected for our analysis (excluding early neonatal deaths) account for some 20% of total mortality in this age group in CCEE, and only between 10% and 15% in CWE, they account for 24% (males) and 39% (females) of the gap in temporary life expectancy (Table 5). In fact, the contribution of the group of conditions amenable to medical intervention is of the same order of magnitude as that of cardiovascular diseases (cf. Table 7).

TABLE 6 *Contribution of causes amenable to medical intervention to the differences in temporary life expectancy (TLE_{0-75}) between Poland and Countries of Western Europe (CWE) and Russian Federation and Countries of Western Euope*

Male	Poland	Russian Federation
Total difference of TLE_{0-75} (yrs)	3.93	6.29
Total difference due to amenable causes of death (yrs)	0.90	1.57
Contribution (yrs) of:		
Tuberculosis	0.04355	0.18524
Chr. rheum. heart dis.	0.06289	0.05744
Acute dis. of respiratory sys.	0.08847	0.72631
Appendicitis	0.00338	0.00810
Hernia abdominalis	0.00998	0.01509
Hypertension and cerebrovasc. dis.	0.24993	0.58455
Early neonatal deaths	0.44395	n.d.a.
Female	**Poland**	**Russian Federation**
Total difference of TLE_{0-75} (yrs)	1.79	2.60
Total difference due to amenable causes of death (yrs)	0.83	1.11
Contribution (yrs) of:		
Tuberculosis	0.00927	0.02305
Chr. rheum. heart dis.	0.06580	0.06377
Acute dis. of respiratory sys.	0.06610	0.40921
Appendicitis	0.00195	0.00482
Hernia abdominalis	0.01001	0.01022
Hypertension and cerebrovasc. dis.	0.23567	0.52985
Cervical cancer	0.08920	0.03163
Maternal mortality	0.00586	0.03335
Early neonatal deaths	0.34565	n.d.a.

n.d.a. = no data available.

This is not to suggest, however, that the contribution of conditions amenable to medical intervention can be interpreted as a direct estimate of the contribution of differences in effectiveness of medical care to the East-West life expectancy gap. Such an interpretation is hampered by several circumstances, including possible differences in registration of causes of death, differences in incidence of these conditions caused by other factors than medical care, and incompleteness of the selection of causes of death.

The utility of vital registration systems depends on good coverage of events, internationally comparable diagnostic procedures and reliable certification.[24] The coverage of death events for the European region of WHO is estimated to he 99%.[25] It is difficult to assess the real coverage of death events registration in the former Soviet republics but some authors suggest possible underestimation of death rates in the period under study.[26,27]

Specific data problems can arise from different practices in registration of early neonatal deaths Although the advice of WHO for registration of fetal and neonatal deaths has been adopted by all member states a substantial degree of underregistration of early neonatal deaths is likely.[26,28] Underregistration may be the possible explanation of the reported very low number of deaths during the first week after birth in the Russian Federation and Romania although the infant mortality rates of these countries are among the highest in Europe.[29] These registration problems could have caused an underestimation of the total contribution of amenable causes of death to differences in life expectancy between CCEE and CWE.

Differences in diagnostic and certifying practices complicate both national and international studies of mortality. Studies comparing international variation in death certification practices showed that individual countries in Western and Eastern Europe differ in certification and coding of underlying cause of death.[30–32] Thus some degree of over- and underregistration of mortality for particular amenable causes of death is likely to exist. As misclassification generates mistakes in both directions, using the aggregated measure for all selected amenable causes in the study assures less biased results.

The evolution of cause-specific mortality depends on changes in incidence and case-fatality rates, and a variety of factors outside the medical care system could have affected the observed difference in amenable mortality between CCEE and CWE. Different economic conditions, nationally specific lifestyle patterns, environmental, genetic or some other variables may be important determinants of variation in the incidence of amenable conditions. Many of these conditions are more unfavourable in CCEE than in CWE, and it is therefore likely that part of the differences in mortality from amenable conditions is due to other factors than differences in effectiveness of medical care. This may apply to all causes included in the selection, but is perhaps especially relevant in the case of hypertension and cerebrovascular disease, which is responsible for a disproportionally large share of the total contribution of amenable conditions to the East-West life expectancy gap. If the higher rates of mortality from this condition in CCEE are due to a higher prevalence of risk factors for this condition (e.g. dietary habits, alcohol consumption, etc), the contribution of amenable conditions to the East-West life expectancy gap would be a gross

TABLE 7 *Contribution of four major cause-of-death groups to the differences in temporary life expectancy (TLE_{0-75}) between Countries of Central and Eastern Europe (CCEE) and Countries of Western Europe (CWE), ca. 1988*

Male	Total differences in in TLE_{0-75} (yrs)	Neoplasms	Cardiovasc. diseases	Respiratory diseases	External causes	% of total difference
Country						
Belarus	4.44	0.47	1.61	0.41	1.30	85.49
Bulgaria	2.68	–0.02	1.48	0.53	0.38	88.31
Czechoslovakia	2.93	0.58	1.42	0.21	0.21	82.63
GDR	1.25	–0.03	0.60	0.11	0.01	55.92
Hungary	4.91	0.67	1.77	0.73	0.43	73.45
Latvia	5.18	0.43	1.85	0.14	1.75	80.71
Lithuania	6.67	1.14	2.30	0.33	1.74	82.55
Poland	3.93	0.41	1.59	0.13	0.61	69.72
Romania	4.38	0.01	1.18	1.23	1.05	79.46
Russian Fed.	6.29	0.62	1.75	1.07	1.67	81.23
Ukraine	4.46	0.52	1.38	0.41	1.24	79.74
Yugoslavia	2.54	0.01	0.75	0.20	0.16	44.36
CCEE	4.82	0.45	1.50	0.68	1.13	78.20
Female	**Total differences in in TLE_{0-75} (yrs)**	**Neoplasms**	**Cardiovasc. diseases**	**Respiratory diseases**	**External causes**	**% of total difference**
Country						
Belarus	1.62	0.07	0.94	0.18	0.20	86.98
Bulgaria	1.82	0.03	1.10	0.37	0.10	88.60
Czechoslovakia	1.49	0.29	0.79	0.11	0.02	82.14
GDR	1.09	0.11	0.54	0.04	0.00	64.55
Hungary	2.79	0.41	1.08	0.10	0.10	60.58
Latvia	2.14	0.19	0.96	0.04	0.43	75.66
Lithuania	1.63	0.18	0.66	0.05	0.34	75.65
Poland	1.79	0.24	0.83	0.05	0.06	66.33
Romania	3.44	0.07	1.18	0.93	0.42	75.97
Russian Fed.	2.60	0.19	1.06	0.60	0.37	85.42
Ukraine	2.08	0.19	1.05	0.19	0.26	81.30
Yugoslavia	2.21	–0.01	0.83	0.23	0.02	48.51
CCEE	2.30	0.18	0.99	0.39	0.25	78.63

overestimate of the contribution of medical care. It is unknown whether this is the case. Declines in stroke mortality over the past decades in the West are at least partly due to improvements in prevention and therapy[33,34] but that does not prove that the unfavourable developments in the East are due to a lack of such improvements. The fact that mortality from so many amenable conditions is higher in CCEE than in CWE only provides some indirect evidence that medical care does play a role, also in the case in stroke mortality.

On the other hand, this element of possible overestimation has to be balanced against an element of underestimation which certainly is also present. Existing differences in effectiveness of medical care also influence other causes of death. For example, the decline of mortality from ischaemic heart disease achieved in Western European countries is likely to be at least partially due to improvements in medical interventions for hypertension as well as in clinical disease.[35] It is quite likely that these improvements have not been as rapid

and as effective in CCEE as in CWE, and by keeping ischaemic heart disease, as well as many other causes of death where effective medical care does make some difference, outside our selection of amenable causes we have introduced an element of underestimation of the contribution of medical care to the East-West gap in life expectancy.

The net effect of under- and overestimation of the contribution of differences in medical care to the East-West life expectancy gap is unknown. Our results suggest that the contribution of medical care to the gap in life expectancy may be not as limited as has often been asserted. Improving the standards of medical care delivered in CCEE may be one approach for bridging the gap in health status between Eastern and Western Europe.

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