Seminar 1 of the IUSSP Committee on Emerging Health Threats
DETERMINANTS OF DIVERGING TRENDS IN MORTALITY
19-21 June 2002, Rostock

Income and Health – a comparison of its association in capitalist West and communist East Germany

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Introduction

For many years, the established wisdom for explaining the statistical association between social status and health even in developed states with a generous social security was a allegedly greater prevalence of life styles with greater health risk among the low income, low qualification members of society. Pioneer work in this respect has been done by the Human Population Laboratory in Berkeley/California in the 1950es and 1960, based on findings from community studies like the Framingham or the Tecumseh study.

In the recent years overwhelming evidence has surfaced against this long established explanation of socio-economic differences in health status in developed countries. The „hard“ factors of socio-economic status: education, income and occupation in most representative longitudinal individual data sets typically explain a lot more of the social gradient in health than risk factors like physical activity, cigarette smoking, nutrition patterns, and body mass index. Supported are these findings by ecological studies linking a given country's income inequality to the extend of the social gradient in health there.

Milestones of these research lines have been the Black-Report (Townsend Davidson 1982) and the Whitehall-Study (Rose Marmot 1981), a panel study starting in 1969 with 17.533 male civil servants in London. Subjects in the lowest of 4 rank groups had a prevalence of coronary heart disease four times as high as those in the top rank group. Even with Cholesterol in serum, overweight, smoking, high blood pressure and lack of physical exercise controlled, morbidity in the bottom rank still was thrice as high. It was concluded that health behaviour has a smaller effect on health than structural factors as occupational group, income, housing, social support (Davey Smith et al. 1990). There have been large replications of both the **Black-Report** and the **Whitehall-Study**: **Health Divide** (Whitehead 1988) and **Whitehall II** (Marmot et al.1987). A very important other source of information here are the three British birth cohorts: the **National Survey of Health and Development**, NSHD – children born March 3.–9.1946; the **National Child Development Study**, NCDS – children born March 3.–9. 1958; and the **1970 British Cohort Study**, BCS70 children born April 5.–11. 1970.

From the **Whitehall-Study** (Rose Marmot 1981) and the **British Health and Lifestyle Survey** (Blaxter 1990) it was even concluded, that the effect of individual health behaviour is mediated by those structural effects: stop smoking improves your health less significantly if you are poor: *"If circumstances are good, ´healthy' behaviour appears to have a strong influence upon health. If they are bad, behaviours make rather little difference"* (Blaxter 1990, S. 216). This alarming finding, however could not be replicated in a Danish data base and in the **Dutch National Survey of General Practice***,* both of which were specifically designed also for that purpose (Kooiker Christiansen 1995).

Meanwhile there are data bases also from several other countries suited for studied the relative importance of behavioural versus structural effects for the social gradient in health found all over also in the economically developed world. In the Netherlands the Longitudinal **Study on Socio-Economic Health Differences** (LS-SEHD). was started 1993 with 2835 subjects – with an oversampling of high and low status individuals. Most publications based on this data set stress the dominance of

structural over behavioural factors, and the strong effect of living conditions during childhood for adult health (Mheen et al. 1998; Meer Mackenbach 1998; Mackenbach et al. 1997; Schrijvers et al. 1999). Schrijvers et al. (1999) show with the LS-SEHD Data set that mortality differences among subjects with different educational levels is considerably more caused by differences in living conditions rather than in health behaviour.

Lantz et al. (1998) showed with the **Americans' Changing Lives Study**, a national panel study, that the core components of risky health behaviour – smoking, alcohol, overweight, physical activities – altogether have only 12 - 13 % of the predictive power of income on mortality.

Particularly disquieting from a Public Policy Perspective is the strong impact of income which has surfaced in these lines of research, typically even stronger than of education and occupation, because this would suggest completely different remedies of strong social health disparities than if insufficient health education or behavioural risk factors were the main culprit. It may be hypothesised that this close link between income and health characterises capitalist countries only, while the undisputed social gradient of health also in communist countries might have been caused by other dimensions of socio-economic status.

Two excellent reviews of this research are "**Social Determinants of Health: The Solid Facts**" of a WHO sponsored group lead by Richard Wilkinson and Michael Marmot, and the report "**Independent Inquiry into Inequalities in Health**", by task force of the British Health ministry, headed by Sir Donald Acheson. Both were published in 1998.

Data Set

We have a representative health panel data set, comparable in data quantity and quality to some of the large data bases described before, and which in addition is uniquely suited to answer the question about the effect of the socio-economic system. In a national CHD prevention program in West Germany, 1984-86 a National sample in the age range 25-69 was drawn, and 4790 interviews were realised, a response rate of 67%. This **National Health Survey West** was the first wave West of our panel. After the unification of the two Germanies, in 1990/91 with the same instruments, in a similar sample in formerly communist East Germany, 2.617 interviews were realised, a response rate of 70%. A subsample of this **National Health Survey East**, age matched to the first wave West (age range 31-75), served as the first wave East of our panel. In 1998, the two samples from the first wave were surveyed again in a second wave, for those who had died in the interval, date of death, but not cause of death was retrieved from administrative registers. In the East, there are 904, in the West 3939 completed interviews from both waves. Detailed study descriptions can be found in Hoffmeister et al. 1988; Mueller & Heinzel-Gutenbrunner 2001).

At the time of the first wave East, before the economic transition processes, income and social status still reflected the situation during the communist period.

Also, thanks to the enormous transfer payments from West to East, occupational position and income in the East sample were fairly stable through the second wave, partly caused by the fact, that many of the first wave East had gone into retirement during that interval, with pensions reflecting individual lifetime income.

This dataset, in which we can study the impact of two different socio-economic systems within one national culture, and which for that reason also may be genetically more homogeneous than if we compared two different European countries, is being published only now (Mueller & Heinzel Gutenbrunner 2001).

Variables

Following international routine, we measure social status with a composite index made of formal education / qualification, occupational status and income (following the Recommendations on Measuring Sociodemographic Traits in Epidemiological Research of a task force of the German Epidemiological Association (Jöckel et al. 1998)

- **Formal education / qualification** is measured by a 7 categories ordinal scale, integrating formal education (from "no elementary schooling completed" to "full secondary education") and formal occupational qualification (from "unskilled" to "university degree");

- **Occupational status** is measured using an instrument by Ganzeboom et al. (1992), which measures the occupation prestige by the "**International Standard Classification of Occupations 1988**" (ISCO-88) of the International Labour Office of the UN, resulting in the „**Standard International Socio-Economic Index of Occupational Status**“ (ISEI);

- **Income** is measured as the net household income, adjusted by number and age of persons living in the household. Since the exact age composition of the subjects' households is unknown we estimated the adjusted net household income by the formula: net household income, divided by the number of people living in the household, whereby this number has been set to the power 0.73.

- the composite **Socio-Economic Status** (**SES**) is simply the sum of the z-standardised scores for education, occupation and income, with a mean of zero and a standard deviation of three.

- Following standard practise, and also the Recommendations, the influence of social status is measured by checking for an effect of the composite index as well as of each of the three indicators it is composed of.

Health is measured as self-assessed general health, with a wording of the question equivalent to the question # 1 in the SF-36. The reliability, validity and predictive power for differential mortality of that measure is established and generally known.

Results:

Data quality

1. Table 1 shows participation and losses for 2nd wave in percent of completed interviews in the 1st wave

Table 1: participation for 2nd wave in percent of completed interviews in the 1st wave

	West	East
participation	46.5	58.5
losses	42.7	34.2
deaths	10.8	7.4

Mortality as well as the estimated annual loss rate in preparedness to participate in a second wave is about the same as in the waves of the Health and Retirement Study, the large US panel with a similar target population and similar variables, but much more frequent waves (http://www.umich.edu/~hrswww/studydet/techdet/sample.html). We take this as evidence for the good survey and data quality.

2. Income inequality in the data set replicated the income inequality in the total population quite well. Income inequality was lower in the East than in the West.

Table 2: Income inequality in East- and West Germany (Gini-Coefficient)

Wave	East in dataset	East population total	West in dataset	West population total
1 (1984/86)		–	0.26	0.26*
1 (1991/92)	0.19	0.19	-	0.25**
2 (1998)	0.23	0.21***	0.27	0.26***

source for population total: Federal Statistical Office

The indicators of the Socio-Economic Status did change in this adult population sample only somewhat in the occupational status and in income

Table 3: Changes in SES indicators between T1 and T2 (Means), East

SES indicators	T1	T2
Standard International Socio-Economic Index of Occupational Status (ISEI)	45.44	44.69
Income (Deutschmark)	1216	1860

Table 4: Changes in SES indicators between T1 and T2 (Means), West

SES indicators	T1	T2
Standard International Socio-Economic Index of Occupational Status ISEI	47.05	46.09
Income (Deutschmark)	1461	2393

We may take all this findings as evidence for the good survey and data quality of our data base.

Differences between ″respondents" "losses" und "deaths" in 2nd wave

These three groups differ in most health related characteristics, in the East as well as in the West.

In both subsamples, deaths are older than losses and losses are older than respondents. An age standardisation, however, shows that the differences in health related characteristics cannot be explained by the different age structure in the three groups. Typically, the respondents in the 2nd wave were healthier, were more frequently cohabiting, had more friends, and enjoyed a better Socio-Economic Status at the time of the1st wave than "losses" in the 2nd wave, and so were "losses" in comparison with the "deaths" at the time of the 2nd wave.

The same pattern can be observed with respect to health related behaviour: respondents are more aware of health issues, have a more favourable health behaviour, and enjoy more social support from partners and other people.

Table 5: East

Characteristics at 1st wave of "respondents" "losses" und "deaths" in 2nd wave. age-standardised for all characteristics except age and sex proportion

	respondents	losses	deaths
number of subjects	904	528	114
average age****	54.0	56.5	64.2
proportion female (%)	52.2	54.9	44.7
Socio-Economic Status (SES)***	0.38	- 0.45	- 0.39
Income in Deutschmark***	1202	1118	957
education / qualification***	5.0	4.5	5.4
Standard International Socio-Economic Index of Occupational Status (ISEI)***	45.1	41.9	43.4
health satisfaction	4.83	4.63	3.16
self assessed health***	2.81	2.90	3.43
Index of chronical diseases***	1.96	1.90	2.98
Index of symptoms*	18.89	17.75	20.78
Index of functional limitations ***	2.22	2.64	6.02
Index of health behaviour (Smoking, nutrition, physical exercises, BMI)	2.78	2.61	2.59
health awareness	2.61	2.55	2.53
proportion non-smokers (%)	81	73	67
proportion physical exercises (%)*	24	16	18
lifetime number of unemployment spells*	0.11	0.15	0.20
proportion presently unemployed (%)***	7	10	18
social support**	3.52	3.36	3.48
proportion cohabiting (%) **	0.81	0.77	0.68
housing satisfaction	5.72	5.53	5.79

(*): $p \leq 0.05$; (**): $p \leq 0.01$; (***): $p \leq 0.001$

Table 6: West

Characteristics at 1st wave of "respondents" "losses" und "deaths" in 2nd wave. age-standardised for all characteristics except age and sex proportion

	respondents	losses	deaths
number of subjects	3939	3620	915
average age****	47.9	48.5	57.3
proportion female (%)	49.3	52.7	31.7
Socio-Economic Status (SES)***	0.3	- 0.24	- 0.28
Income in Deutschmark***	1453	1363	1410
education / qualification***	4.7	4.4	4.3
Standard International Socio-Economic Index of Occupational Status (ISEI)***	46.4	43.8	43.5
health satisfaction	5.08	4.96	4.53
self assessed health***	2.63	2.72	2.96
Index of chronical diseases***	1.90	2.05	2.56
Index of symptoms*	19.18	19.36	21.48
Index of functional limitations ***	2.3	2.8	4.2
Index of health behaviour (Smoking, nutrition, physical exercises, BMI)	2.73	2.66	2.54
health awareness	2.77	2.76	2.81
proportion non-smokers (%)	72	66	45
proportion physical exercises (%)*	39	32	27
lifetime number of unemployment spells*	0.33	0.41	0.52
proportion presently unemployed (%)***	2	4	6
social support**	2.51	2.45	2.45
proportion cohabiting (%) **	0.85	0.82	0.79
housing satisfaction	6.08	5.96	5.97

(*): $p \leq 0.05$; **(**):** $p \leq 0.01$; **(***):** $p \leq 0.001$

We check for the following associations:

1. Which one of the three indicators of social status: income, education and occupation, is the most powerful predictor of self-assessed general health?

2. The panel data permit studying the direction of causality, which is especially important in the case of income: Is an eventual association between income and health more the result of a selection, with poor health causing a shift in income, or, conversely, the results of a causation process, with low income causing poor health?

3. To which proportion can any association between socio-economic status and health be explained by different prevalence of health behaviour (physical activity, cigarette smoking, nutrition patterns, and Body Mass Index)?

In a cross sectional perspective, SES has an effect on health comparable in size to the effect of age, and bigger than sex:

East: *men and women*

Table 7: SES T1 and self assessed health T1

cross sectional T1, dep. variable: self assessed health T1					
Model (OLS regression)	Non-standardised coefficient		standardised coefficient		
	B	standard error	Beta	T	Significance
(constant)	1.920	.167		11.509	.000
female	7.216E-	.053	.045	1.363	.173
age	1.444E-	.003	.173	5.270	.000
SES T1	- 4.25E-0	.011	- .127	- 3.825	.000

Table 8: SES T2 and self assessed health T2

cross sectional T2, dep. variable: self assessed health T2					
Model (OLS regression)	Non standardised coefficient		standardised coefficient		
	B	standard error	Beta	T	Significance
(constant)	1.944	.172		11.298	.000
female	1.052E-02	.054	.006	.194	.846
age	1.595E-02	.003	.187	5.644	.000
SES T2	- 4.84E-02	.011	- .146	- 4.376	.000

SES maintains its effect on health, if we progress to a longitudinal perspective:

Table 9: SES T1 and self assessed health T2

longitudinal T1 - T2, dep. variable: self assessed health T2					
Model (OLS regression)	Non standardised coefficient		standardised coefficient		
	B	standard error	Beta	T	Significance
(constant)	.946	.162		5.846	.000
health T1	.475	.030	.463	15.692	.000
female	- 1.79E-0	.048	- .001	- .037	.970
age	1.015E-	.003	.119	4.035	.000
SES T1	- 1.78E-0	.010	- .052	- 1.751	.080

West: *men and women*

Table 10: SES T1 and self assessed health T1

cross sectional T1, dep. variable: self assessed health T1					
Model (OLS regression)	Non standardised coefficient		standardised coefficient		
	B	standard error	Beta	T	Significance
(constant)	1.5	.0		19.56	.0
female	8.563	.0	.0	3.2	.0
age	2.066	.0	.2	15.06	.0
SES T1	- 6.26E	.0	- .1	- 11.59	.0

Table 11: SES T2 and self assessed health T2

cross sectional T2, dep. variable: self assessed health T2					
Model (OLS regression)	Non standardised coefficient		standardised coefficient		
	B	standard error	Beta	T	Significance
(constant)	1.835	.079		23.145	.000
female	9.4583E	.027	.006	.355	.723
age	1.782E-	.001	.198	12.644	.000
SES T2	- 6.41E-0	.005	- .188	- 11.865	.000

Here, too, SES maintains its effect on health, if we progress to a longitudinal perspective:

Table 12: SES T1 and self assessed health T2

longitudinal T1 - T2, dep. variable: self assessed health T2					
Model (OLS regression)	Non standardised coefficient		standardised coefficient		
	B	standard error	Beta	T	Significance
(constant)	1.080	.073		14.739	.000
health T1	.423	.015	.425	29.086	.000
female	- 1.75E-0	.024	- .010	- .730	.465
age	1.140E-	.001	.128	8.915	.000
SES T1	- 3.56E-0	.005	- .102	- 7.164	.000

Following standard practise, we test the statistical association between SES and health with the three single indicators of socio-economic status. Since in this age group, education does not change at all any more, and occupation only slightly, we only look into the effect of income, but have the effects of educational and occupational status statistically controlled for.

Table 13: Income T1 and self assessed health T2, East

longitudinal T1 - T2, dep. variable: self assessed health T2					
Model (OLS regression)	Non standardised coefficient		standardised coefficient		
	B	standard error	Beta	T	Significance
(constant)	2.044	.192		10.624	.000
female	8.080E-02	.053	.050	1.524	.128
age	1.466E-02	.003	.176	5.300	.000
Income T1	- 1.26E-04	.000	- .072	- 2.147	.032

There is a moderate, but significant effect of income on health, although, the effect of education is slightly larger (not shown)

West

Men and women

Table 14: Income T1 and self assessed health T2, West

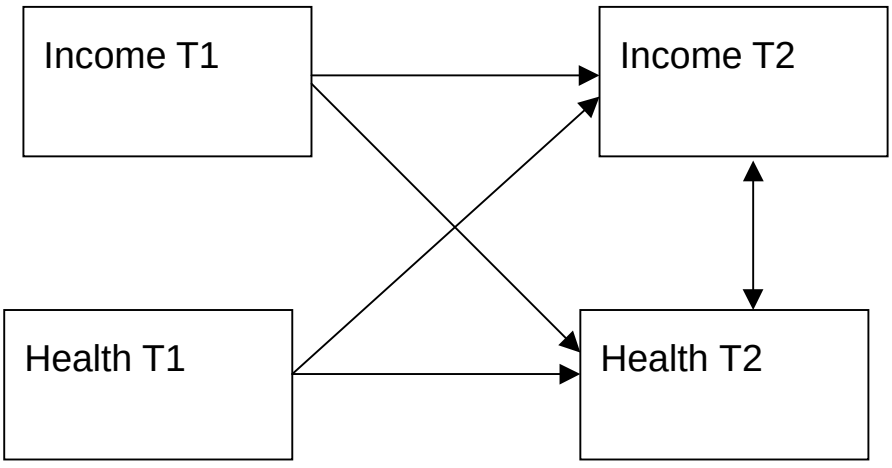
longitudinal T1 - T2, dep. variable: self assessed health T2					
Model (OLS regression)	Non standardised coefficient		standardised coefficient		
	B	standard error	Beta	T	Significance
(constant)	1.650	.081		20.382	.000
female	.120	.026	.070	4.543	.000
age	2.253E-	.001	.252	16.149	.000
Income T1	- 1.92E-0	.000	- .158	- 10.110	.000

In the West, the effect of income is even more pronounced: a significant effect of income on health, larger than the effects of education or occupation (not shown).

Possibly, there is a summation of a bi-directional effect: income affects health, and health affects income (Heinzel-Gutenbrunner 2000), something which is unlikely in education or occupation in middle aged adults (see the Black Report: Townsend Davidson 1982).

Now we will use the panel character of the data in order to determine whether the association between income and health is more the result of causation or of selection. The complete model of causal influences is shown in this diagram:

Figure 1:



Suitable statistical models are structural equation models (syn.: path analysis models). But also in such models, if they are fully identified - that is: if all possible relations are considered at once - estimation problems may arise.

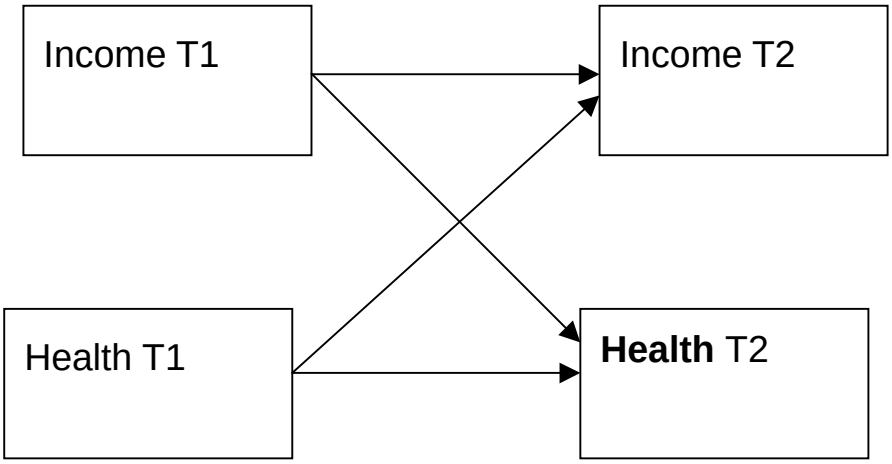
Therefore, two more constrained structural equation models are considered:

(1) Cross-lagged Effects Models

(2) Synchronous Effects Models

Cross-lagged Effects Models

Figure 2:



We estimate for the two sexes and the two subsamples separately

East

The Maximum-Likelihood-Estimations with the resulting standardised coefficients are

Men

Income T2 = – 0.0704*Health T1 + 0.5424*Income T1
– 0.0576*Age+ 0.8278*E(I)

Health T2 = – 0.0345*Income T1 + 0.4768*Health T1
+ 0.1031*Age + 0.8585*E(II)

Women

Income T2 = – 0.0626*Health T1 + 0.4737*Income T1
+ 0.0109* Age 0.8765*E(I)

Health T2 = – 0.0412*Income T1 + 0.4775*Health T1
+ 0.1035* Age + 0.8606*E(II)

All coefficients in all four equations are significant.

E(I) and E(II) in all these structural equation notations here are the error terms, that is the sum of all other influence factors plus random effects. In two equations there are two error terms, which we denote with (I) and (II) in order to avoid any confusion with the index 1 and 2 for 1st and 2nd survey wave.

Goodness of fit was checked with 4 criteria:

(1) chi-square

(2) Comparative Fit Index

(3) Non-normed Index

(4) Normed Fit Index

(described in Bentler & Bonett's 1980).

In all two subsamples - women East and men East - is the influence of income T1 on income T2 on the one side, and of Health T1 on Health T2 a lot larger than the two cross-lagged influences. In both cases, however, the influence of

Income T1 on Health T2 smaller than of Health T1 on Income T2. This supports that, here, the association income with health is produced more by selection than by causation.

West

Men

Income T2 = - 0.0857*Health T1 + 0.5724*Income T1
- 0.1084*Age + 0.8063*E(I)

Health T2 = - 0.1078*Income T1 + 0.4361*Health T1
+ 0.0914* Age + 0.8737*E(II)

Women

Income T2 = - 0.0744*Health T1 + 0.6023*Income T1
- 0.1758* Age + 0.7800*E(I)

Health T2 = - 0.0493*Income T1 + 0.4284*Health T1
+ 0.1635* Age + 0.8645*E(II)

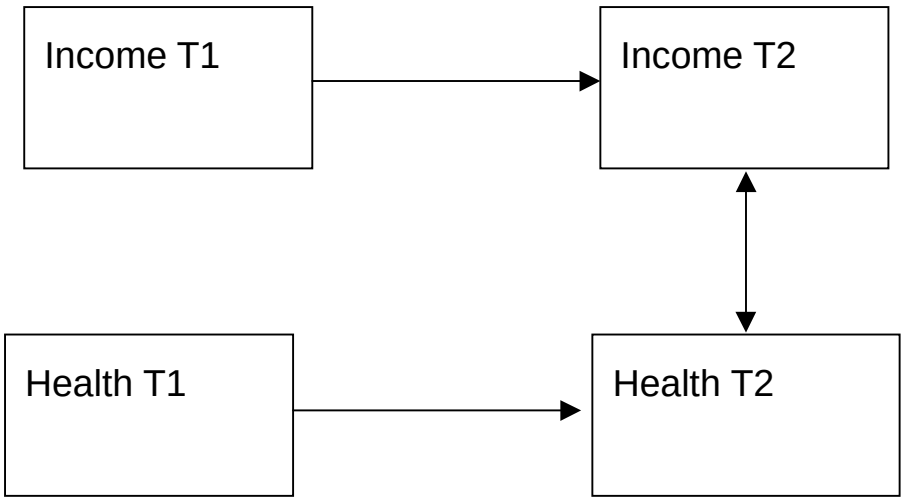
➢In the West we find more or less the same as in the East with one important exception: While for women, here, the influence of income T1 on health T2 is smaller than of health T1 on income T2, which again supports that, here, the association income with health is produced more by selection than by causation. In men in the West, however, the effect of income T1 on health T2 is thrice as large as the effect of health T1 on income T2, which supports the interpretation that, here, the association income with health is produced more by causation than by selection.

Synchronous Effects Models

Given the long intervals between 1st and 2nd wave, bi-directional relations (synchrone effects) in the associations between income und health is imaginable (Courgeau Lelievre 1992). more recent influences, however, may be better represented by present measures rather than by influences a long time ago. In our example that means health at T2 may be maximally influenced by income shortly before T2, which in turn may be better measured by income at T2 than by income

at T1. Likewise, income at T2 may be maximally influenced by health shortly before T2, which in turn may be better measured by health at T2 than by health at T1.

Figure 3:



Again, we estimate for the two sexes and the two subsamples separately

East

Men

Income T2 = 0.5409*Income T1 – 0.0931*Health T2
- 0.0519*Age + 0.8240*E(I)

Health T2 = - 0.0345*Income T2 + 0.4768*Health T1
+ 0.1031* Age + 0.8585*E(II)

Women

Income T2 = 0.4721*Income T1 – 0.0637*Health T2
+ 0.0123* Age + 0.8740*E(I)

Health T2 = - 0.0594*Income T2 + 0.4419*Health T1
+ 0.1389* Age + 0.8627*E(II)

West

Men

Income T2 = 0.5803*Income T1 – 0.0351*Health T2
- 0.1209* Age + 0.8079*E(I)

Health T2 = - 0.0988*Income T2 + 0.4372*Health T1
+ 0.0736* Age + 0.8742*E(II)

Women

Income T2 = 0.6084*Income T1 – 0.0572*Health T2
- 0.1805* Age + 0.7810*E(I)

Health T2 = - 0.0261*Income T2 + 0.4326*Health T1
+ 0.1534* Age + 0.8647*E(II)

Results are similar to those of the cross-lagged models:

in East German women and in East German men, as well as in West German women, the association between health and income is more produced by selection, in West German men it is produced more by causation.

Next we estimate the proportion of the social health gradient which is produced by social differences in health behaviour. We dichotomise self assessed health and estimate by logistic regressions the individual probability to have a self assessed health below the sample median. We estimate

- in model A the effect of age, sex and SES or one of its indicators (education, occupation, income).
- in addition, model B contains an index of health behaviour, which counts the number of positive behaviours from zero to four: 1. no smoking; 2. a BMI less than 25, 3. 1-2 hours of physical activities (including heavy gardening) on a regular basis, 4. healthy nutrition index (“no whole grain bread, no salad, no fresh vegetables, no fresh food” = 0, “plenty of whole grain bread, salad, fresh vegetables, fresh food on a regular basis” = 20) greater than 11.

The proportion of the variance explained by health behaviour, is calculated by the reduction of the Odds Ratios(OR) by the formula:

$$\frac{(OR(\text{ Model A}) - OR(\text{ Model B}))}{(OR(\text{Model A})-1)}$$

Education

The following table contains the Odds Ratios of Model A and the Odds Ratios of Model B after the reduction by health behaviour

Table 15: Education and health behaviour: Odds Ratios and Reduction of Odds Ratios, East

independent variable	Model A	Model B	Reduction
	OR (95 % Conf-Interv.)	OR (95 % Conf-Interv.)	
Education	0.82 (0.75–0.91)	0.83 (0.75–0.91)	5 %
Index of health behaviour		0.94 (0.78–01.14)	

Table 16: Education and health behaviour: Odds Ratios and Reduction of Odds Ratios, West

independent variable	Model A	Model B	Reduction
	OR (95 % Conf-Interv.)	OR (95 % Conf-Interv.)	
Education	0.80 (0.76–0.85)	0.84 (0.80–0.89)	20 %
Index of health behaviour		0.67 (0.62–0.73)	

In East Germany the effect of education as well as the proportion of this effect which can be explained by health behaviour (5 %), is lower than in West Germany (20 %).

Occupation

The following table contains the Odds Ratios of Model A and the Odds Ratios of Model B after the reduction by health behaviour

Table 17: Occupation and health behaviour: Odds Ratios and Reduction of Odds Ratios, East

independent variable	Model A	Model B	Reduction
	OR (95 % Conf-Interv.)	OR (95 % Conf-Interv.)	
Occupation	0.77 (0.66–0.91)	0.78 (0.66–0.92)	7 %
Index of health behaviour		0.91 (0.76–1.1)	

Table 18: Occupation and health behaviour: Odds Ratios and Reduction of Odds Ratios, West

independent variable	Model A	Model B	Reduction
	OR (95 % Conf-Interv.)	OR (95 % Conf-Interv.)	
Occupation	0.73 (0.68–0.78)	0.77 (0.73–0.83)	17 %
Index of health behaviour	0.69	0.69 (0.64–0.75)	

Again, in East Germany the effect of occupation as well as the proportion of this effect which can be explained by health behaviour (7 %), is lower than in West Germany (17 %).

Income

The following table contains the Odds Ratios of Model A and the Odds Ratios of Model B after the reduction by health behaviour

Table 19: Income and health behaviour: Odds Ratios and Reduction of Odds Ratios, East

independent variable	Model A	Model B	Reduction
	OR (95 % Conf-Interv.)	OR (95 % Conf-Interv.)	
Income	0.87 (0.76–0.1)	0.88 (0.76–1.1)	7 %
Index of health behaviour		0.89 (0.73–1.1)	

Table 20: Income and health behaviour: Odds Ratios and Reduction of Odds Ratios, West

independent variable	Model A	Model B	Reduction
	OR (95 % Conf-Interv.)	OR (95 % Conf-Interv.)	
Income	0.80 (0.77–0.84)	0.82 (0.7580.86)	10 %
Index of health behaviour	0.68	0.94 (0.63–0.73)	

Again, in East Germany the effect of income as well as the proportion of this effect which can be explained by health behaviour (7 %), is lower than in West Germany (10 %).

Index of Socio-Economic Status

The following table contains the Odds Ratios of Model A and the Odds Ratios of Model B after the reduction by health behaviour

Table 21: Index of SES and health behaviour: Odds Ratios and Reduction of Odds Ratios, East

independent variable	Model A	Model B	Reduction
	OR (95 % Conf-Interv.)	OR (95 % Conf-Interv.)	
Income	0.89 (0.84–0.95)	0.90 (0.85–0.95)	9 %
Index of health behaviour		0.92 (0.77–1.11)	

Table 22: Index of SES and health behaviour: Odds Ratios and Reduction of Odds Ratios, West

independent variable	Model A	Model B	Reduction
	OR (95 % Conf-Interv.)	OR (95 % Conf-Interv.)	
Income	0.85 (0.83–0.88)	0.87 (0.85–0.90)	13 %
Index of health behaviour		0.70 (0.65–0.76)	

As to be expected from the previous findings, in East Germany the effect of income as well as the proportion of this effect which can be explained by health behaviour (9 %), is lower than in West Germany (13 %).

Put it the other way round: in the East max. 9%, in the West 20% of the social gradient in self assessed health can be statistically explained by an index which summarises the four – by our present knowledge- most important health behaviour factors: smoking, physical activity level, overweight, nutrition quality.

Here are the main findings of this paper:

1. In the East as in the West, of all three indicators of social status, income, before education and occupation, was a powerful predictor of self-assessed general health. In the West, it was the most powerful. This finding is limited, however, by the age limits of the sample – since after age 35 or so neither formal education nor occupation changes substantially any more – and by the fact that we do not know anything about the social status of the subjects' parents, which may have had considerable influence on the subjects' health and social status as adults.

2. The panel data permitted studying the direction of causality, which is especially important in the case of income: for both sexes in the East and for women in the West this strong statistical association is more the result of a selection, with poor health causing a shift in income. For men in the West, however, the association reflects a causation process, with low income causing poor health.

3. Controlling for the four main risk factors physical activity, cigarette smoking, nutrition patterns, and Body Mass Index, and also controlling for age and sex, reduces the statistical association of income and self-assessed general health in East Germany only by 7%, in West Germany by 10%. Reduction of the effects of education (5% vs. 20%) or occupation (7% and 17%) on health is in the same range. Reduction of the effect of social status as a whole on health was 9% and 13%, respectively.

We conclude that, although the income distribution in East Germany was lower than in the West in both waves (Gini Coefficient in first wave East: .19, West .26; in second wave: .23 and .27, resp.), the association between income and health under communism was only slightly less pronounced than in the West. At the same time, this association could only to a modest degree be explained by a more risky lifestyle among the poor. The association, however, at least among men, in the East might have been more the effect of selection into rather than by the exposition low income.