The changing importance of educational inequalities to lifespan variation: Estonia and Lithuania examined over the 1990s

Alyson A. van Raalte[1,2], Anton E. Kunst[3] and Johan P. Mackenbach[2]

[1] Max Planck Institute for Demographic Research, Rostock, Germany. Correspondence to: vanraalte@demogr.mpg.de
[2] Department of Public Health, Erasmus MC, Rotterdam, the Netherlands
[3] Department of Public Health, Academic MC, University of Amsterdam, Amsterdam, the Netherlands

Draft version: 9 April 2010

Please do not cite without the consent of the authors

Introduction: Subpopulation mortality distributions can differ from one another because of differences in average lifespans (between-group inequalities) as well as differences in how lifespans are distributed within the group (within-group variation). In a previous study of 11 European countries we estimated that between educational-group inequalities explained about 0.4-9.9 percent of all individual level lifespan variation (ages 30-110+), depending on the measure, country and gender (van Raalte et al., 2009). Of these countries, Lithuania and Estonia had the highest dispersion in age-at-death and had among the largest contributions from the between-group component. This is unsurprising given that both countries experienced widening mortality trajectories by education during the 1990s, as death rates continued to fall among the highly educated but actually worsened among those with lower levels of education (Leinsalu et al., 2009). Had it not been for an upward shift in the educational composition, remaining life expectancy in Estonia would have fallen an additional 0.96 years during this period (Shkolnikov et al., 2006). As Lithuania also experienced substantial compositional changes during this period it is fair to assume that a similar study would probably have yielded similar results. Additionally, a quick calculation reveals both countries also experienced widening lifespan variation during the 1990s.[1]

This leads to the question of whether socioeconomic variables had changed in importance in the way they impacted the individual level distribution in age-at-death. In this study we aim to

[1] Author's calculations based on period life tables of the Human Mortality Database, ages 0-110+, 1990-2000. This can be seen for both countries and genders.

determine how widening mortality differentials by level of education changed both the between- and within-group components of lifespan variation, using the mean logarithmic deviation and its associated additive decomposition. Additionally, to separately analyse direct versus compositional changes brought about by increasing education levels, we apply the dynamic decomposition technique of Mookherjee and Shorrocks (1982) for the first time to the study of lifespan variation.

Data and Methods: We used cross-sectional, census-based data assembled and harmonised as part of the Eurothine project. Both countries had two data files covering a few years surrounding two different census rounds: 1988-1990 and 2000-2002 for Lithuania, and 1987-1991 and 1998-2002 for Estonia. These contained sex-specific death counts and exposures by level of education, aggregated into 5-year age intervals from ages 30 to 70+. Comparable educational levels had been created by regrouping national education schemes into three categories of the International System of Classification of Educations (ISCED): less than secondary education, completed secondary education, and tertiary education.

To improve the precision of the age-at-death distribution, the national population death and exposure counts reported by single year of age in the Human Mortality Database (HMD) were proportioned out to each educational group, according to their corresponding shares derived from the Eurothine data for the equivalent time periods. The matching was done per 5-year age group for ages 30 to 69. Relative mortality risks were assumed to remain constant within the 5-year age categories. Ages above 70 were left in an open-ended interval to reduce known data problems at these ages (Shkolnikov et al., 2007). Resulting from this matching were national death rates by single year of age (30-69, plus 70+), sex, and level of education (1-3) for each of the two periods.

Using these death rates, life tables were created for each sex and level of education, corresponding to each country and period. This allowed us to calculate temporary lifespan variation between the ages 30 and 70 ($e_{30|70}$) from the life table death density without confounding from the age structures of the educational subgroups.

Lifespan variation was measured using the mean logarithmic deviation (*MLD*) developed by Theil (1967). This is an entropy measure commonly used in economic research, shown to correlate closely with other inequality measures (Cowell, 1995). The primary advantages to this measure are that it is both additively decomposable such that total inequality is the sum of its between-group (*BG*) and within-group (*WG*) components, and it is decomposable over time into direct and compositional changes operating on both components.

From the life table death density the *MLD* of lifespan variation is calculated by:

$$MLD = \frac{1}{l_0}\sum_{x=0}^{\omega} d_x \left[\ln\left(\frac{e^0}{\bar{x}_x} \right) \right], \tag{1}$$

where d_x is the death density and $\bar{x}_x$ the average age at death in the age interval x to x+1. The initial population size is l_0 and e^0 is the average lifespan, taken in this study to be the temporary life expectancy between ages 30 and 70 ($e_{30|70}$). The product is summed from initial age 0 (30 in this study) to the oldest age ω (70+ in this study). The greater is the value of the index, the greater the variation in age-at-death. To ensure consistency between the educational subgroup populations and the aggregated national population, (temporary) life expectancy was calculated according to an alternative formulation of remaining life expectancy,

$$e_0 = \frac{1}{l_0}\sum_{x=0}^{w} d_x \bar{x}_x \ .$$

Theil's additive decomposition of *MLD* as applied to lifespan variation becomes:

$$MLD = \sum_{i=1}^{n} w_i \ln\frac{e^0}{e_i^0} + \sum_{i=1}^{n} w^i I^i \ , \tag{2}$$

where w is the population share and e_i^0 the lifespan of subgroup i. The first term measures the *BG* component by assuming that everyone in each subgroup dies at the subgroup's average age-at-death. In other words, it calculates the variation in subgroup average lifespans. The second term in equation 2 measures the *WG* component, and is the population-weighted average of the lifespan variation. The contribution of the *BG* component to total lifespan variation is simply the *BG* component divided by the *MLD* in lifespans of the whole population.

Age decomposition of $e_{30|70}$ and $MLD_{30|70}$ was done by step-wise decomposition (Andreev et al., 2002) using a macro developed by Evgueni Andreev. Decomposing the change in $MLD_{30|70}$ over the two time periods into direct and compositional changes in the *BG* and *WG* components was done using the dynamic decomposition of Mookherjee and Shorrocks (1982)[2]. In demography, this decomposition analysis has been used to decompose whether inequalities in world life expectancy changed because life expectancies changed at different rates across countries or because populations grew faster in countries with unusually low or high life expectancies (Goesling and Firebaugh, 2004). To our knowledge it has never been applied to examine changes in the death density. The decomposition results in four terms that can be interpreted respectively as the change in $MLD_{30|70}$ owing to:

1. the change in the *WG* component from changing death rates
2. the change in the *WG* component from the upward shift in the educational composition
3. the change in the *BG* component from the upward shift in the educational composition
4. the impact from *relative* changes in subgroup temporary life expectancies (i.e., if all subgroups experienced the same proportional increase in $e_{30|70}$, this term would be zero).

Given the small size of the population subgroups we also produced 95 % confidence intervals around our estimates of temporary life expectancy and temporary lifespan variation. This was done by Monte Carlo simulation, assuming a binomial distribution of death counts. For each age interval the number of observations in each simulation round was based on the observed number of deaths, *Dx*, divided by the probability of dying, *qx*. The simulated death counts, dx^{sim}, divided by observed population exposures, *Nx*, gave us simulated death probabilities qx^{sim}. From these values we simulated 1000 life tables which we used to generate confidence intervals around our life expectancy and lifespan variation estimates. Similar methods have been applied to generate

[2] This refers to their equations 14 *a* through *d*, which is an approximate decomposition. The approximation is widely used in the economics literature and found to be good. They also give an exact decomposition (eq. 13 substituted into 12). Due to the additional terms we found this equation more difficult to interpret.

confidence intervals around life expectancy and healthy life expectancy for small populations (Veugelers et al., 2000, Salomon et al., 2001, Silcocks et al., 2001, Eayres and Williams, 2004).

Results:

Temporary life expectancy was lower for both males and females in Lithuania and Estonia at the end of the 1990s than it was in the beginning (Table 1). Alongside decreased longevity, lifespan variation clearly increased in Estonia and stagnated in Lithuania (Table 2). Age decomposition of the changes to $e_{30|70}$ and $MLD_{30|70}$ helps to understand the country differences (Figure 1). The lower $e_{30|70}$ was mainly attributable to ages 35 to 55 for women, while the 70+ age category was additionally a large contributor for men. That Estonia experienced increased $MLD_{30|70}$ while Lithuania showed little change in the measure is explained primarily by the 30-40 age category. Lithuanians had lower death rates over these ages in the later period, which reduces lifespan variation, while Estonia had increased death rates. Proportionally, increases in $MLD_{30|70}$ were higher among females, although Estonian males experienced the largest absolute expansion in this measure.

Educational subgroups, however, fared rather differently from the national populations. As has been remarked upon elsewhere (Leinsalu et al., 2003, 2009), the tertiary educated improved their lifespans, while temporary life expectancy was actually lower for the less than secondary educated group in the second period than in the first. The female secondary educated groups experienced stagnation while the males had reduced longevity in the latter period. Differences by educational subgroup in lifespan variation showed similar patterns to trends in temporary life expectancy with the lowest educated evidently responsible for much of the rise in the $MLD_{30|70}$, and the tertiary educated experiencing mainly lower lifespan variation in the latter period.

As we would have expected from widening inequalities in temporary life expectancies, the *BG* inequality component increased substantially (Table 3). Proportionally increases were higher among females while males had larger absolute increases. The *WG* component, measuring the average subgroup lifespan dispersion levels, also rose for both female populations and for male Estonians. Despite increases in lifespan variation among both the less than secondary and upper secondary educated groups (Table 2), the male Lithuanians registered a decrease in their within-group component over the 1990s (Table 3). Thus the slight rise in lifespan variation in the total male population came entirely from the rise in the *BG* component.

In all cases, the contribution of *BG* inequality to total lifespan variation rose. In the early period females had levels comparable to *BG* contributions in western European countries in the middle of the 1990s (results not shown). However by the second period, the variation in temporary life expectancy among the educational subgroups was explaining 5-6 times more of the total lifespan variation over these age ranges. Male increases in the contribution of *BG* inequality were proportionally smaller.

Meanwhile, during this period both countries experienced upward shifts in their educational composition (Figure 2). Among the entire population, the proportion having at a minimum higher secondary education rose from 55 to 70 percent in Estonia and from 49 to 69 percent in Lithuania.

Turning to the results from the dynamic decomposition (Figure 3), it becomes apparent that direct changes in the *WG* component fuelled the increase in lifespan variation in Estonia. Had the educational composition in the later period been the same as in the earlier period, *WG* variation would have increased by over 50 percent for females in Estonia, and by about a quarter for males due to increased mortality at early adult ages (increasing the left tail of the distribution) and lower mortality at older ages. The rise in the educational composition of the population of course tempered these rises. In Lithuania, direct and compositional changes practically cancelled themselves out. This explains why Lithuanians experienced little change in the WG component, as fewer individuals were a part of the lower educated subgroup that experienced rising levels of lifespan variation. Changes in relative mean lifespans were also adding to the general increase in the MLD for all populations, leading to a higher overall BG component.

Discussion:

Summary of results

This analysis showed that temporary lifespan variation between the ages of 30 and 70 was higher at the end of the 1990s as it was in the beginning, and proportionally higher for females. This expansion was much greater in Estonia than in Lithuania, unlike the drop in temporary life expectancy, which was similar in both countries. This was owing to the differential mortality patterns over age. Estonians experienced higher mortality in the age category 30-40 during the later period, while these were ages where Lithuanians posited reduced mortality.

The diverging mortality experiences by educational subgroup led to greater stratification in the age-at-death distributions, as well as increased inequalities in temporary life expectancy. Consequently, the BG inequality component both rose and explained a greater part of the lifespan variation. Expansion of the age-at-death distribution in the lower and middle educated groups fuelled the overall increase in lifespan variation, although this was to some degree tempered, particularly in Lithuania, by a rising educational composition.

Evaluation of data and methods

The nature of unlinked studies introduces a numerator/denominator bias, as educational status was self-reported on the census and reported by next of kin on the death records. While in principle this bias could go either way (Shai and Rosenwaike, 1989, Sorlie and Johnson, 1996, Rosamond et al., 1997), the Lithuanian data for the later period we use here has been shown to overestimate educational inequalities in mortality, particularly among females, by overestimating mortality in the lowest educated groups and underestimating mortality among the tertiary educated (Jasilionis et al., 2006, Shkolnikov et al., 2007, van Raalte et al., 2009). Although no linkage study has been performed in the earlier period, speculation is that the bias might have been smaller due to greater discipline in reporting information to authorities, more uniform educational systems across the Soviet Union and greater coherence among educational categories in the Soviet census and death records (Jasilionis et al., 2009). On the other hand misreporting was greater among those with less formal education which could also suggest that the situation might have been worse in the earlier period given the higher proportion of the population in the lower educated groups. Unfortunately no linkage study has been performed in Estonia over either period although we would assume an overestimation of mortality inequalities there as well.

Given that no better data exists for Estonia or for the earlier period in Lithuania, we have taken steps to mitigate this bias. Misreporting by education was found to be strongest in the oldest age categories. Presumably this is because these individuals would have been educated in pre-Soviet times, categories which did not always correspond well with categories listed on the death records. Therefore, we limited our analysis to temporary lifespan variation between the ages of 30 and 70 as suggested by Shkolnikov et al. (2007). Also, although we had data differentiated by primary and lower secondary education, we collapsed these two categories, assuming that much of the misreporting would be happening between these two groups.

The mortality shocks experienced by Estonia and Lithuania during the 1990s were most severe during the middle part of the decade (Figure 4). Our educational subgroup data is aggregated around a few years at the beginning and end of this decade. Thus the changes we observe reflect the changes in age-specific mortality at the beginning and end of the decade, and unfortunately cannot capture the changes in the middle part of the decade. Moreover, the study periods differ by a few years in Estonia than Lithuania, which might partially account for some of the observed differences between the two countries.

Usage of a different measure would have resulted in differences in the magnitude of change in lifespan variation over this time. The mean logarithmic deviation, though well correlated with other measures, is known to be more sensitive to changes in the left tail of the distribution. As a result, it responded more to changes over this period than other measures of lifespan variation, given that mortality increases were concentrated precisely at these younger adult ages, although the general pattern remained similar (Figure 4). However the mean logarithmic deviation is the only additively decomposable measure whose between- and within-group components can be decomposed into direct and compositional effects.

Additionally, there could be concern about the statistical power of mortality estimates of the educational subgroups. Lithuania and Estonia are small populations. However, the confidence intervals obtained via Monte Carlo simulations showed that our point estimates for both temporary life expectancy and temporary lifespan variation were reasonable. Thus we do not expect our results to be heavily biased based on random fluctuations of vital events.

Finally there is a question about whether three subgroups are enough to capture the contribution of educational inequalities to lifespan variation. In a previous study we found only a small reduction in the BG component by reducing the number of educational subgroups from four to three (van Raalte et al., 2009). So long as we are capturing a linear gradient to mortality we do not expect this bias to be large.

Conclusion

This paper has demonstrated another dimension to the mortality shocks experienced by Estonia and Lithuania during the 1990s. In particular, it has shown that compositional changes to the populations tempered what would have been an even larger increase in lifespan variation. Lower educated groups especially faced much larger lifespan variation at the end of the 1990s as they did in the beginning. Also, it has shown that women experienced great changes to their age-at-death distribution, an aspect not well highlighted in the literature on transitional mortality experiences. Finally it revealed that the contribution of educational differences in mortality on lifespan variation increased substantially in both Lithuania and Estonia during the tumultuous period.

Greater lifespan variation implies greater uncertainty in the timing of death. Cast in this way, it may be even more detrimental to life planning and well-being than a lower average lifespan. Although higher life expectancy is almost universally associated with lower lifespan variation

(Smits and Monden, 2009, Vaupel et al., 2009) this paper has shown that both dimensions are important to examine, as trends in the average and variation around this average can sometimes point in different directions.

While this study was focussed on the exceptional changes occurring in Lithuania and Estonia during the 1990s, the methods developed here are general. By separately examining between-group average and within-group distributional changes in age-at-death we get a different, but complementary picture to traditional methods that focus on socioeconomic inequalities as being between-group differences. Moreover, decomposing lifespan variation into direct and compositional changes can help to determine the efficacy of public health policies in targeting vulnerable groups, who because of compositional changes may be becoming increasingly selected. Reducing socioeconomic inequality requires both raising the average length of life of disadvantaged groups as well as reducing the dispersion around this average.

References:

Human Mortality Database. University of California, Berkeley (USA), and Max Planck Institute for Demographic Research (Germany). Available at www.mortality.org (data downloaded on 05/02/2009)

ANDREEV, E., SHKOLNIKOV, V. & BEGUN, A. Z. (2002) Algorithm for decomposition of differences between aggregate demographic measures and its application to life expectancies, healthy life expectancies, parity-progression ratios and total fertility rates. *Demographic Research,* 7(14).

COWELL, F. A. (1995) *Measuring inequality (2nd edition)*, Hemel Hempstead, Harvester Wheatsheaf.

EAYRES, D. & WILLIAMS, E. S. (2004) Evaluation of methodologies for small area life expectancy estimation *J Epidemiol Community Health* 58**,** 243-249

GOESLING, B. & FIREBAUGH, G. (2004) The Trend in International Health Inequality. *Population and Development Review,* 30**,** 131-146.

JASILIONIS, D., SHKOLNIKOV, V. M. & ANDREEV, E. M. (2009) Commentary: The study by Leinsalu et al. on mortality differentials in Eastern Europe highlights the need for better data. *Int. J. Epidemiol.***,** dyn371.

JASILIONIS, D., STANKUNIENE, V. & SHKOLNIKOV, V. M. (2006) *Socio-demographic mortality differentials in Lithuania, 2001-2004. Outcomes from the first census-linked study.,* Vilnius, Statistics Lithuania, Institute for Social Research.

LEINSALU, M., STIRBU, I., VAGERO, D., KALEDIENE, R., KOVACS, K., WOJTYNIAK, B., WROBLEWSKA, W., MACKENBACH, J. P. & KUNST, A. E. (2009) Educational inequalities in mortality in four Eastern European countries: divergence in trends during the post-communist transition from 1990 to 2000. *Int J Epidemiol,* 38**,** 512-525.

LEINSALU, M., VAGERO, D. & KUNST, A. E. (2003) Estonia 1989-2000: enormous increase in mortality differences by education. *Int. J. Epidemiol.,* 32**,** 1081-1087.

MOOKHERJEE, D. & SHORROCKS, A. (1982) A Decomposition Analysis of the Trend in UK Income Inequality. *The Economic Journal,* 92**,** 886-902.

ROSAMOND, W. D., TYROLER, H. A., CHAMBLESS, L. E., AARON, R. F., LAWTON, C. & CONWILL, D. (1997) Educational Achievement Recorded on Certificates of Death Compared with Self-Report. *Epidemiology,* 8**,** 202-204.

SALOMON, J. A., MATHERS, C. D., MURRAY, C. J. & FERGUSON, B. (2001) Methods for life expectancy and healthy life expectancy uncertainty analysis. *Global Programme on Evidence for Health Policy Working Paper No. 10, World Health Organization*.

SHAI, D. & ROSENWAIKE, I. R. A. (1989) ERRORS IN REPORTING EDUCATION ON THE DEATH CERTIFICATE: SOME FINDINGS FOR OLDER MALE DECEDENTS FROM NEW YORK STATE AND UTAH. *Am. J. Epidemiol.,* 130**,** 188-192.

SHKOLNIKOV, V. M., ANDREEV, E. M., JASILIONIS, D., LEINSALU, M., ANTONOVA, O. I. & MCKEE, M. (2006) The changing relation between education and life expectancy in central and eastern Europe in the 1990s. *J Epidemiol Community Health,* 60**,** 875-881.

SHKOLNIKOV, V. M., JASILIONIS, D., ANDREEV, E. M., JDANOV, D. A., STANKUNIENE, V. & AMBROZAITIENE, D. (2007) Linked versus unlinked estimates of mortality and length of life by education and marital status: Evidence from the first record linkage study in Lithuania. *Social Science & Medicine,* 64**,** 1392-1406.

SILCOCKS, P. B. S., JENNER, D. A. & REZA, R. (2001) Life expectancy as a summary of mortality in a population: statistical considerations and suitability for use by health authorities *J Epidemiol Community Health* 55**,** 38-43.

SMITS, J. & MONDEN, C. (2009) Length of life inequality around the globe. *Social Science & Medicine,* 68**,** 1114-1123.

SORLIE, P. D. & JOHNSON, N. J. (1996) Validity of Education Information on the Death Certificate. *Epidemiology,* 7**,** 437-439.

THEIL, H. (1967) *Economics and Information Theory,* Amsterdam, North-Holland Publishing Co.

VAN RAALTE, A., KUNST, A. E. & MACKENBACH, J. P. (2009) How much are educational differences contributing to individual lifespan disparities? *Paper presented at the XXVI IUSSP International Population Conference, in session 196: "Socio-economic inequality and mortality". Marrakech, Morocco.*

VAUPEL, J. W., ZHANG, Z. & VAN RAALTE, A. (2009) Life expectancy and disparity. *Paper presented at the 74th Annual Population Association of America meeting, in session 15: "Life expectancy". Detroit MI.* .

VEUGELERS, P. J., KIM, A. L. & GUERNSEY, J. R. (2000) Inequalities in health. Analytic approaches based on life expectancy and suitable for small area comparisons *J Epidemiol Community Health* 54**,** 375-380.

Tables & Figures

Table 1: Temporary life expectancy between the ages of 30 and 70 by country, gender and educational subgroup; 'Total' refers to all subgroups combined. Numbers in italics refer to 95 % confidence intervals based on Monte Carlo simulation

	Males				Females			
	lower ed.	upper sec.	tertiary	**Total**	lower ed.	upper sec.	tertiary	**Total**
Estonia 1990*	31.9 *(31.7, 32.1)*	34.1 *(34.0, 34.3)*	36.1 *(35.9, 36.2)*	**33.4**	36.8 *(36.7, 37.0)*	37.6 *(37.5, 37.6)*	38.2 *(38.1, 38.3)*	**37.3**
Estonia 2000†	29 *(28.7,29.3)*	32.6 *(32.5, 32.7)*	36.7 *(36.5, 36.8)*	**32.2**	34.8 *(34.5, 35.1)*	37.3 *(37.3, 37.4)*	38.6 *(38.5, 38.7)*	**36.8**
Lithuania 1990*	31.8 *(31.6, 31.9)*	34.2 *(34.1, 34.3)*	36.6 *(36.4, 36.7)*	**33.3**	36.5 *(36.4, 36.7)*	37.7 *(37.7, 37.8)*	38.2 *(38.1, 38.3)*	**37.2**
Lithuania 2000†	28.4 *(28.2, 28.7)*	33.6 *(33.5, 33.7)*	36.8 *(36.7, 37.0)*	**32.6**	34.4 *(34.1, 34.7)*	37.8 *(37.7, 37.8)*	38.7 *(38.6,38.7)*	**36.8**

*the 1990 period corresponds to 1987-1991 in Estonia and 1988-1990 in Lithuania
†the 2000 period corresponds to 1998-2002 in Estonia and 2000-2002 in Lithuania

Table 2: The temporary mean logarithmic deviation of lifespan variation between the ages of 30 and 70 (x 100) by country, gender and educational subgroup; 'Total' refers to all subgroups combined. Numbers in italics refer to 95 % confidence intervals based on Monte Carlo simulation

	Males				Females			
	lower ed.	upper sec.	tertiary	**Total**	lower ed.	upper sec.	tertiary	**Total**
Estonia 1990*	12.2 *(11.5, 12.8)*	7.2 *(7.0, 7.5)*	4.5 *(4.1, 4.9)*	**9.2**	4.7 *(4.2, 5.3)*	2.7 *(2.5, 2.8)*	1.8 *(1.6, 2.0)*	**3.5**
Estonia 2000†	16.2 *(15.2, 17.3)*	9.2 *(8.9, 9.5)*	3.7 *(3.3, 4.1)*	**10.7**	9 *(7.8, 10.2)*	3.2 *(3.0, 3.4)*	1.8 *(1.5, 2.0)*	**4.7**
Lithuania 1990*	14.7 *(13.9, 15.5)*	7.8 *(7.6, 8.0)*	3.8 *(3.5, 4.1)*	**10.8**	6.5 *(5.7, 7.4)*	2.8 *(2.7, 3.0)*	2.1 *(1.9, 2.3)*	**4.7**
Lithuania 2000†	17.4 *(16.6, 18.3)*	8.5 *(8.3, 8.8)*	3.8 *(3.4, 4.1)*	**10.9**	9.4 *(8.5, 10.3)*	2.9 *(2.8, 3.0)*	1.5 *(1.3, 1.7)*	**4.8**

*the 1990 period corresponds to 1987-1991 in Estonia and 1988-1990 in Lithuania
†the 2000 period corresponds to 1998-2002 in Estonia and 2000-2002 in Lithuania

Table 3: The temporary mean logarithmic deviation between the ages 30 and 70 (x100) ($MLD_{30|70}$) and its decomposition into within-group (WG) and between-group (BG) components; BG/T is the contribution of between-group inequalities to temporary lifespan variation

	Males				Females			
	$MLD_{30\|70}$	*WG*	*BG*	***BG/T***	$MLD_{30\|70}$	*WG*	*BG*	***BG/T***
Estonia 1990*	9.15	9.05	0.1	**1.14**	3.5	3.49	0.01	**0.25**
Estonia 2000†	10.73	10.42	0.31	**2.89**	4.74	4.68	0.07	**1.46**
Lithuania 1990*	10.83	10.71	0.12	**1.14**	4.69	4.67	0.02	**0.35**
Lithuania 2000†	10.85	10.44	0.41	**3.79**	4.83	4.72	0.11	**2.25**

*the 1990 period corresponds to 1987-1991 in Estonia and 1988-1990 in Lithuania
†the 2000 period corresponds to 1998-2002 in Estonia and 2000-2002 in Lithuania

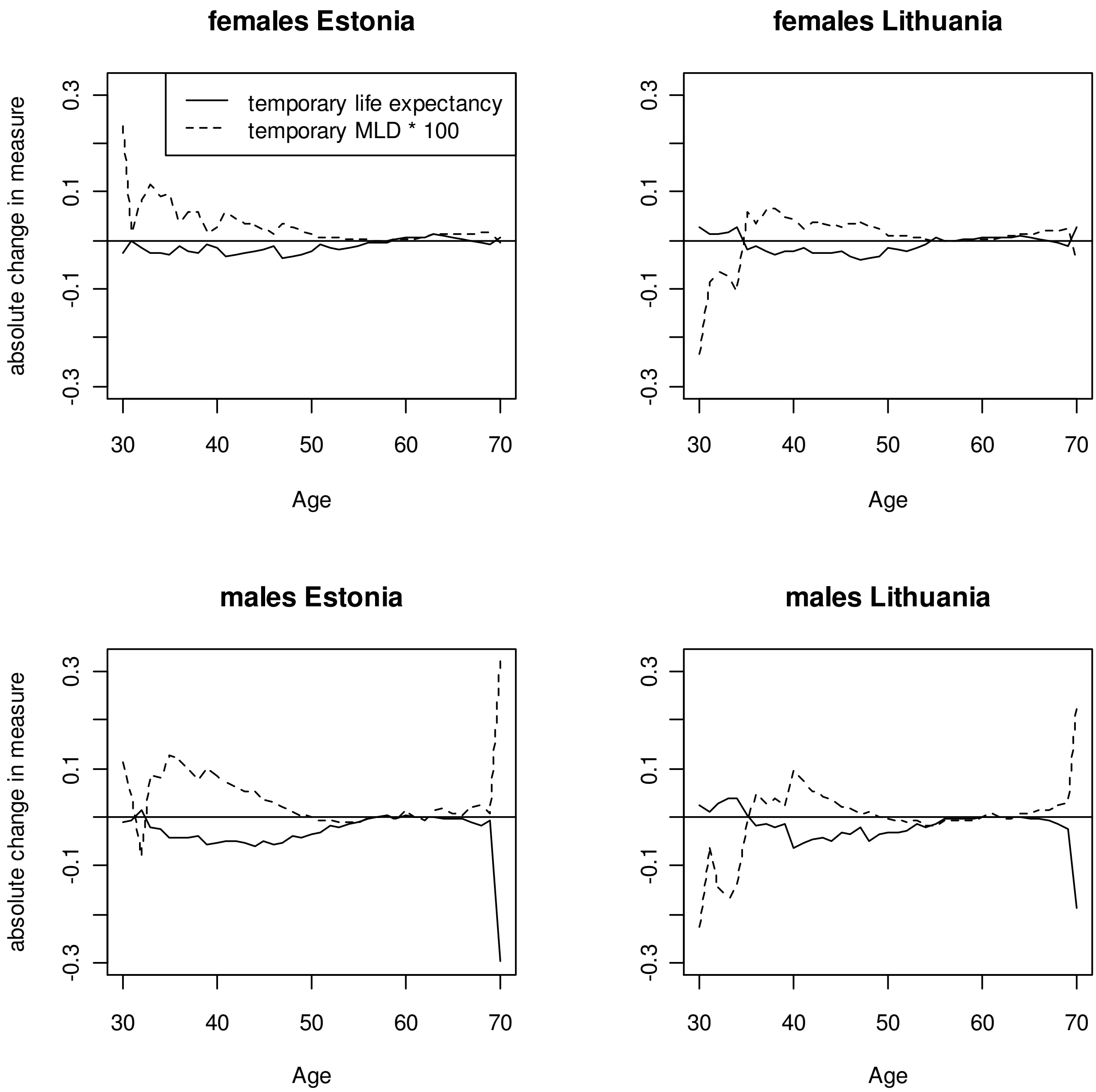

Figure 1: Age decomposition of changes to $e_{30|70}$ and $MLD_{30|70}$ *100 between the two periods

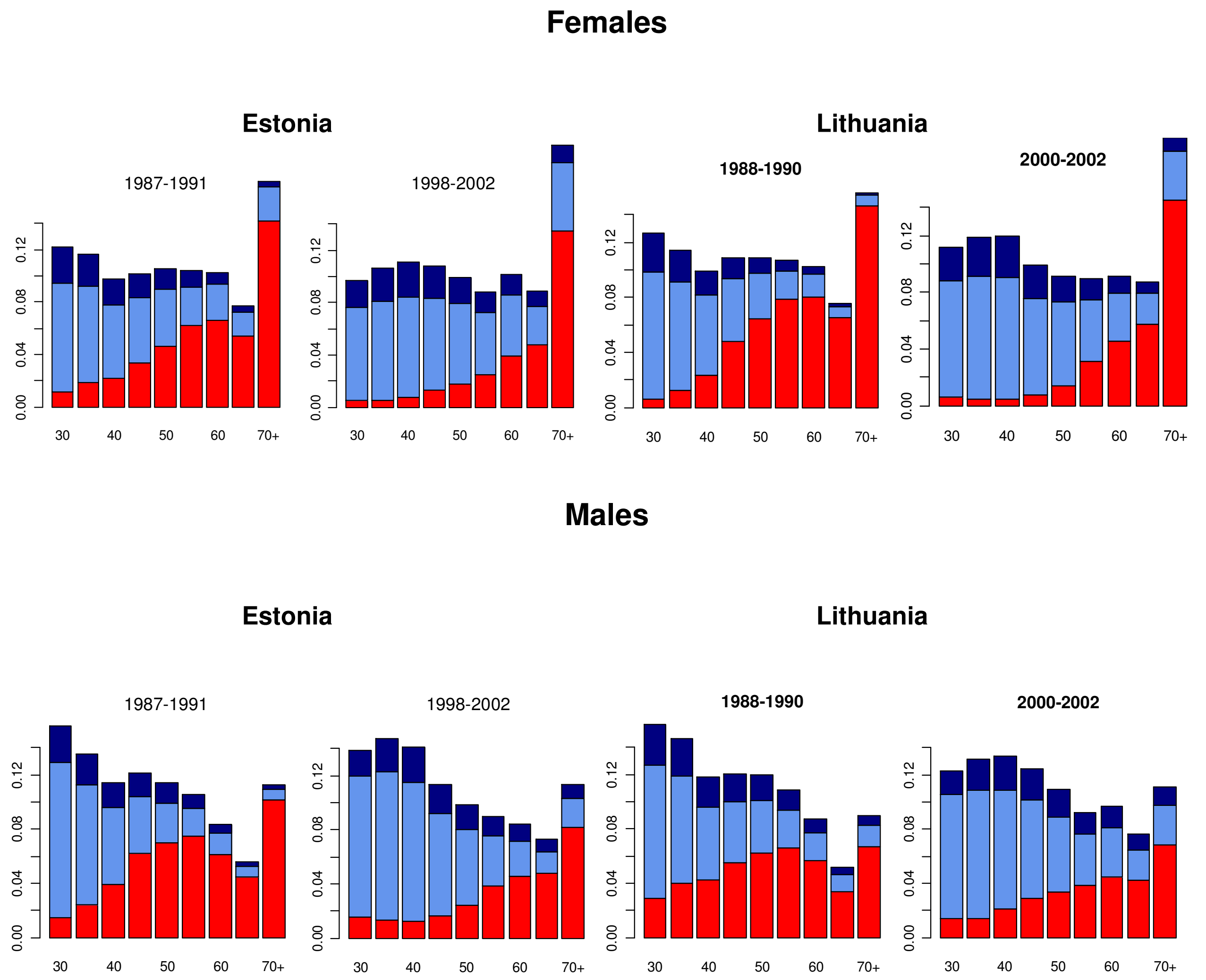

Figure 2: Population proportion by age, sex, country and educational level. The red bars refer to less than secondary education, the light blue bars completed secondary education and the dark blue bars tertiary education. Data source: Eurothine dataset.

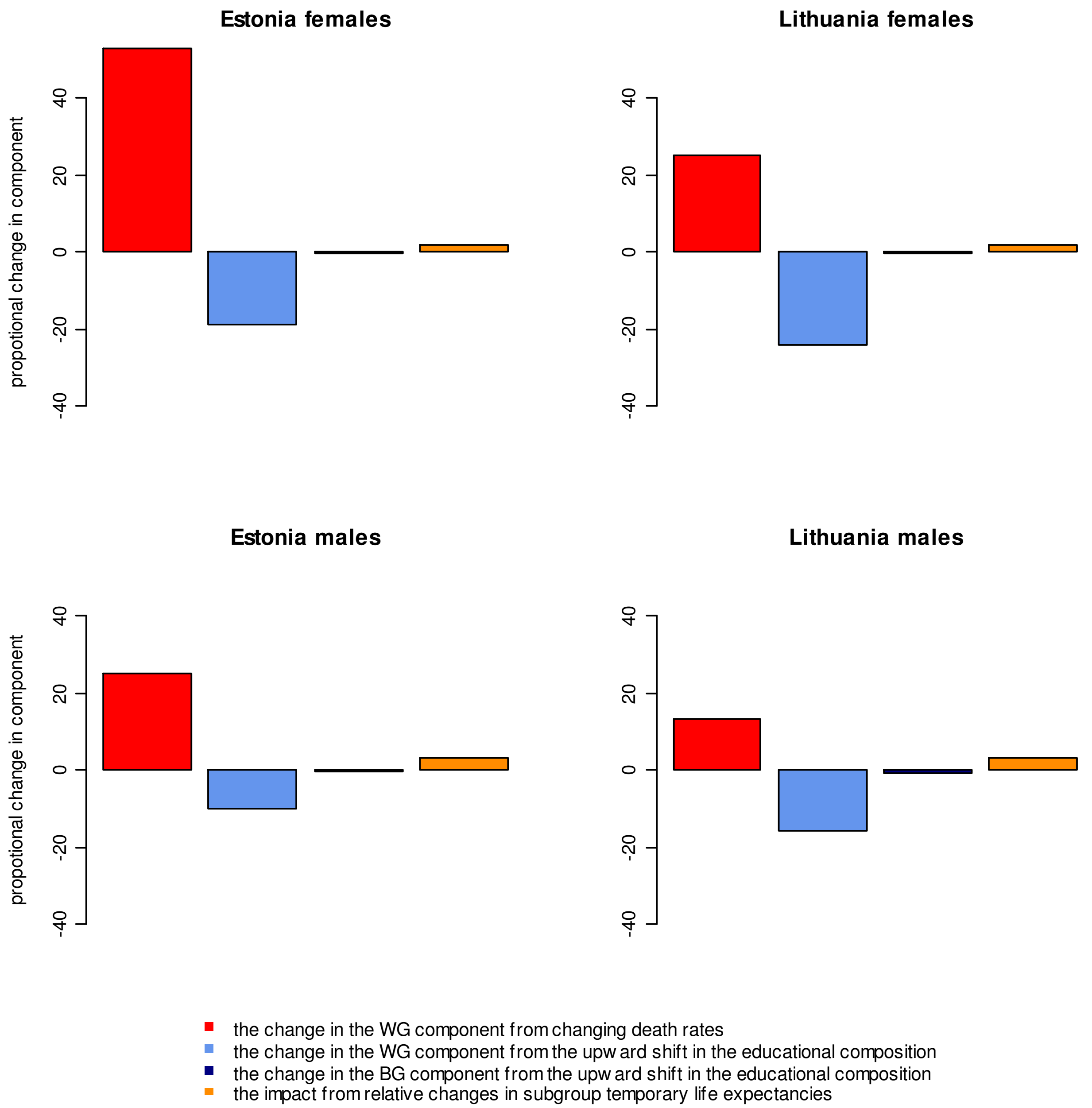

Figure 3: Changes in lifespan variation (MLD) attributable to direct and compositional changes in the within- and between-group components over the two time periods.

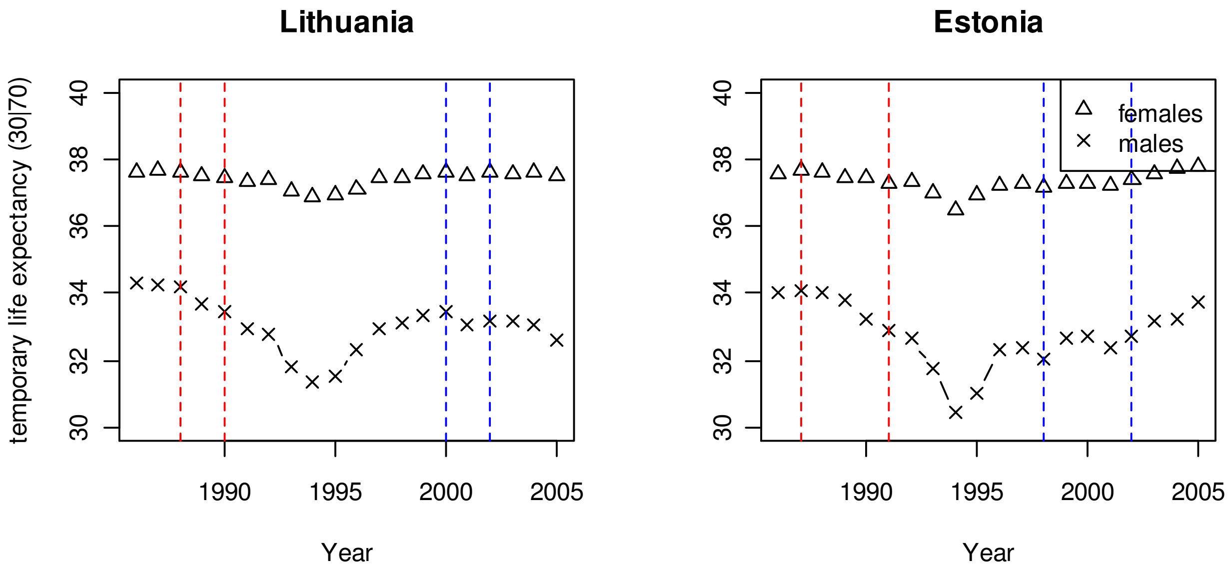

Figure 4: Trends in temporary life expectancy between the ages of 30 and 70, Lithuania and Estonia. The period in-between the two red bars corresponds to our earlier period, while the years in-between the blue bars are our later period. The measures were calculated based on period life tables from the Human Mortality Database, accessed 01/02/2010.

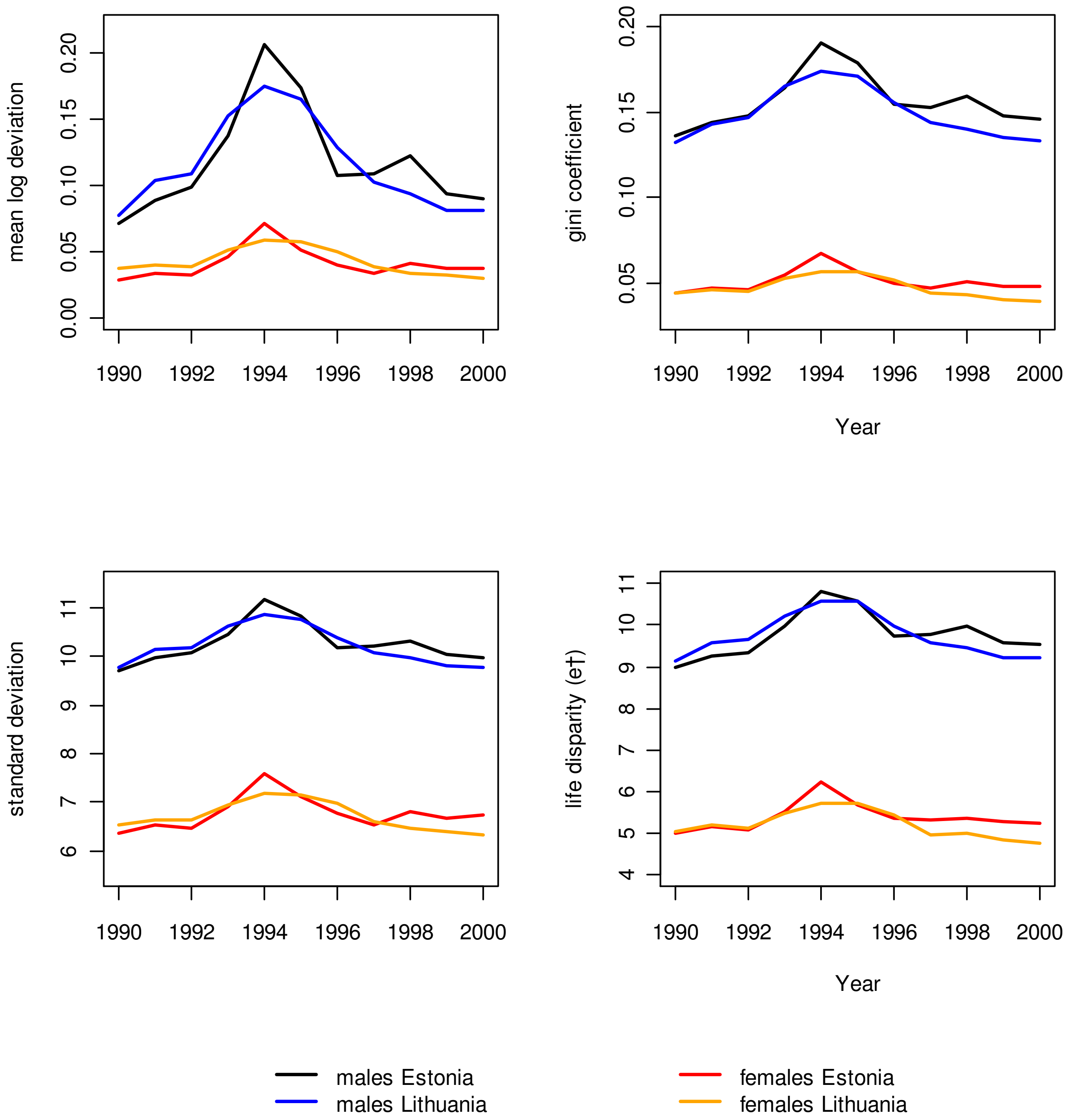

Figure 5: The time trends in lifespan variation between the ages 30 and 70 according to various measures. The measures were calculated based on period life tables from the Human Mortality Database, accessed 01/02/2010.