Высшая школа экономики
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Эпидемиологические исследования феномена российской смертности

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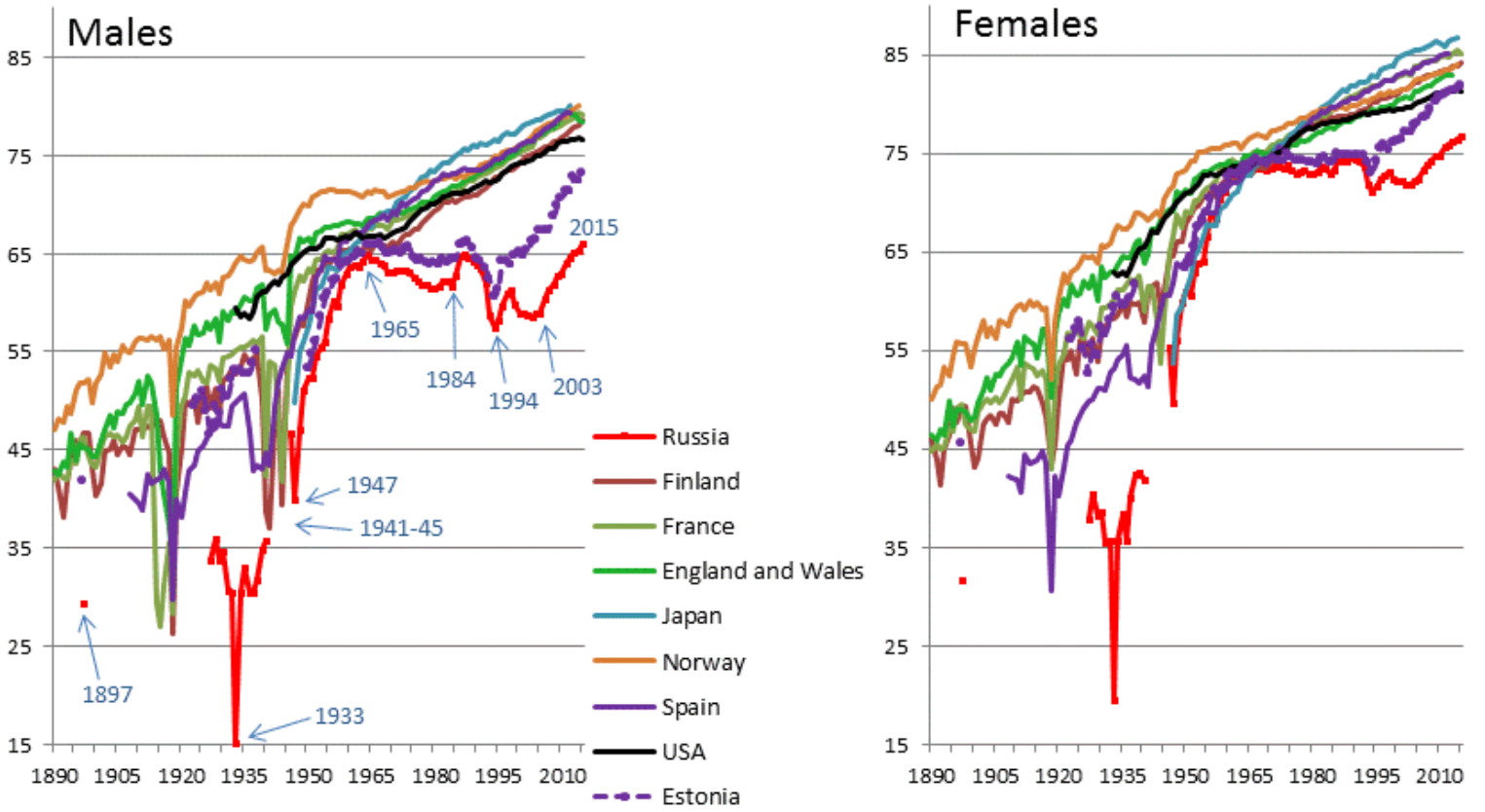
What is unusual about the Russian mortality? Population-level evidence

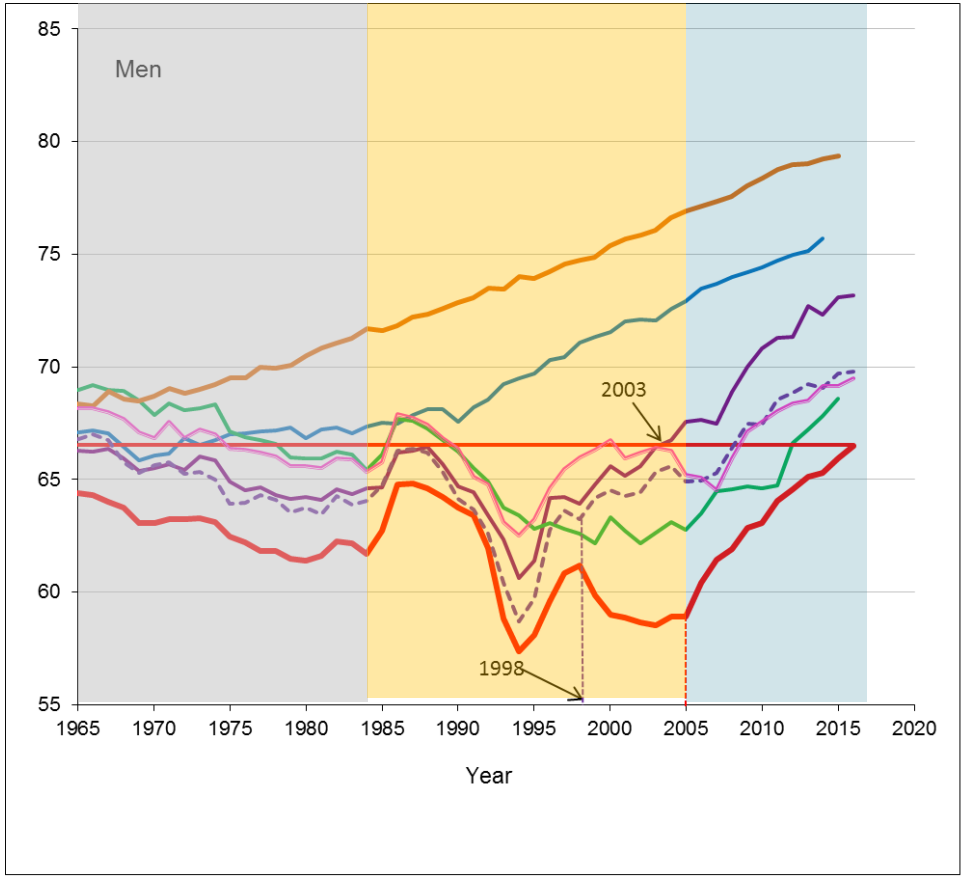
Life expectancy in Russia: long-term mortality reversal and recent recovery

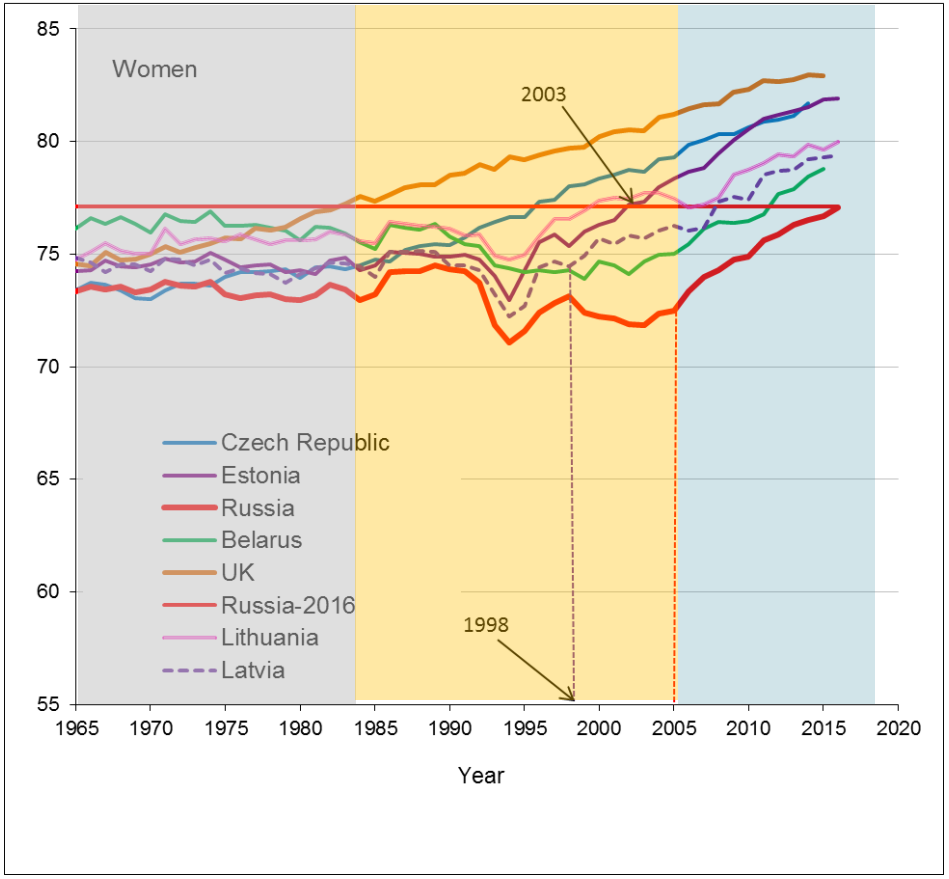


Three important facts about Russia: 1) extremely high (medieval) mortality in 1896-97 and the catastrophes of the 1930s-40s; 2) rapid progress and convergence with other countries in the 1950s-early 60s. 3) the major deviation begins in 1965.

LE-long-term.xlsx

Life expectancy trends in selected countries. Three segments of the Russian trend





Beginning of the upward trend: CzR - early 1990s, Est – mid-1990s; Latvia – late 1990s, Rus and Bel – mid-2000s. Visible convergence of Estonia with the western vanguard.

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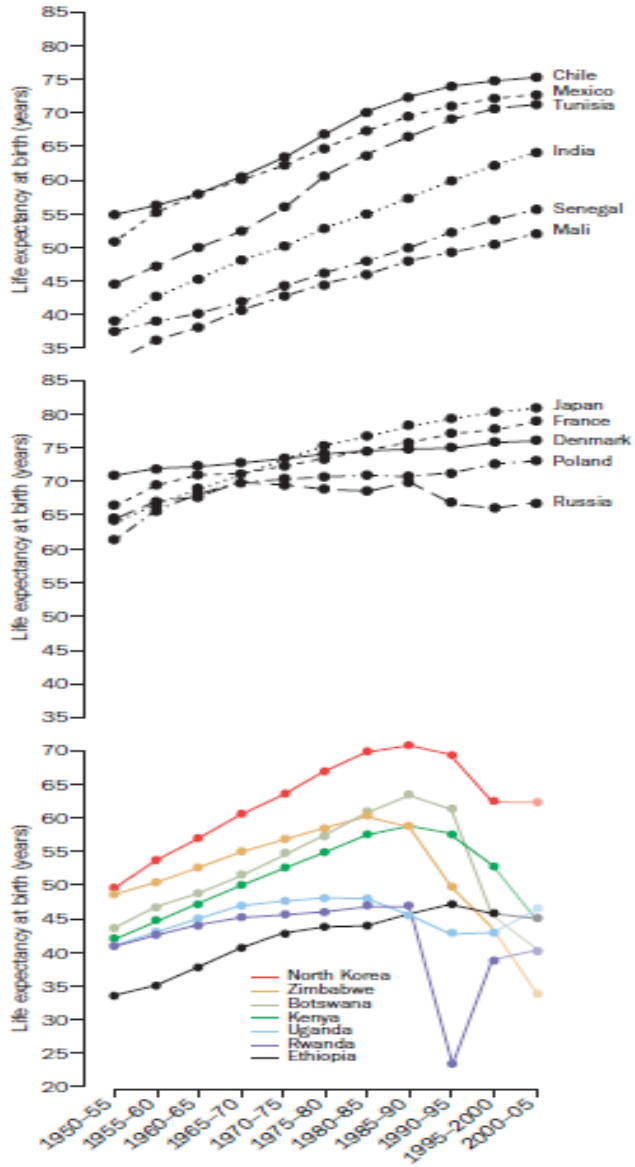
The Russian mortality reversal. Is it unique ?



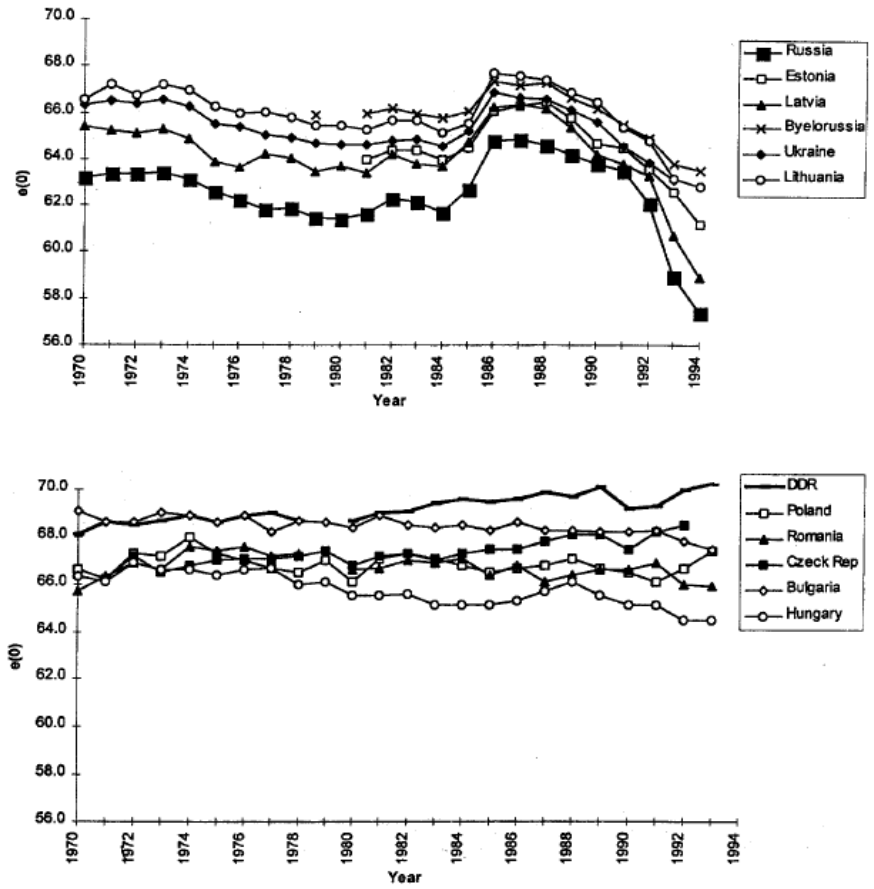
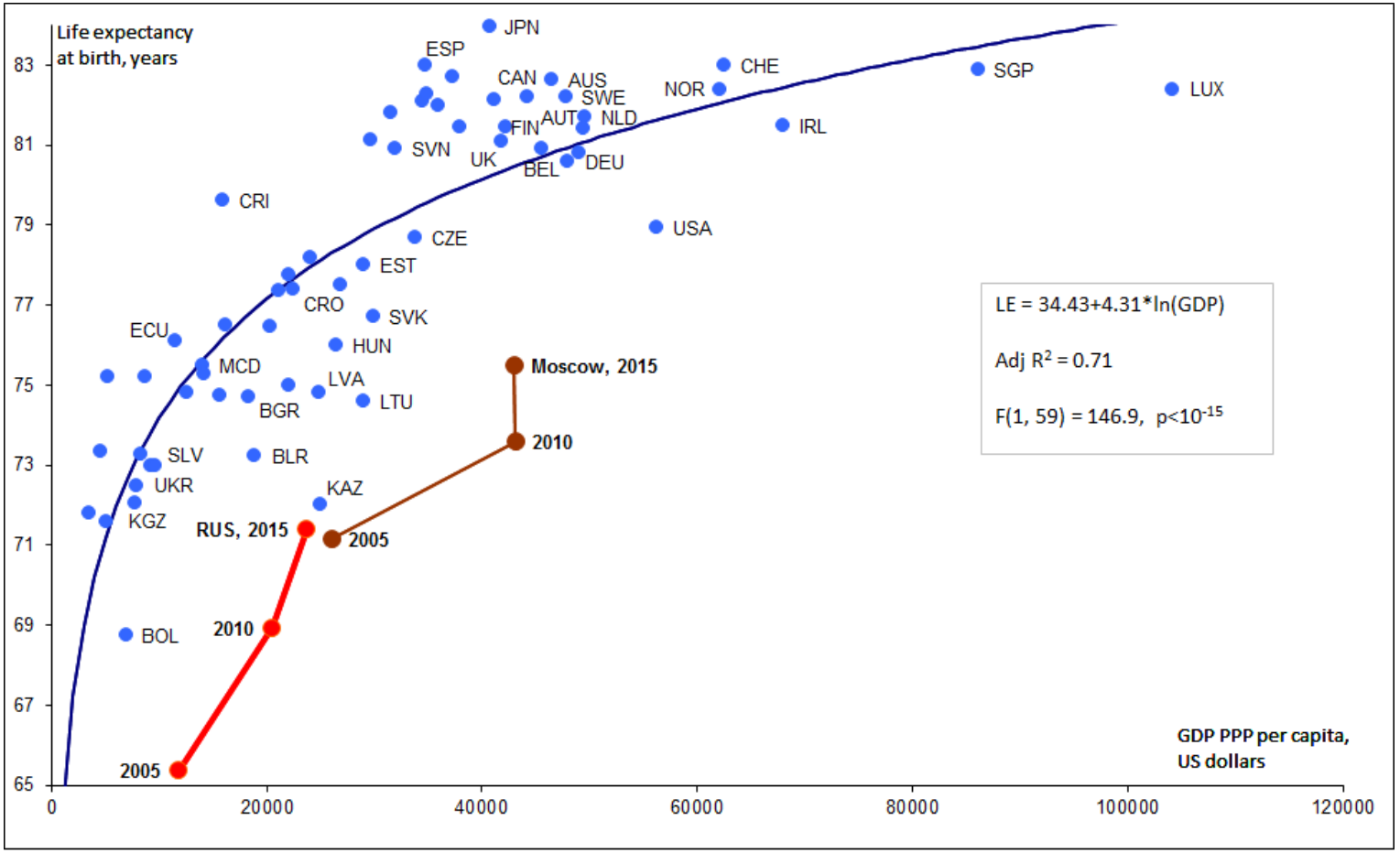


Figure 2. *Trends in male life expectancy at birth in five former Soviet Republics and in the countries of Eastern Europe in 1970–94.*

McMichael, A.J., M.McKee, V.Shkolnikov, T.Valkonen. 2004. Mortality trends and setbacks: global convergence or divergence? The Lancet, 363, April 3, pp. 1155-1159.

Shkolnikov, V.M., Cornia, G.A., Leon, D.A., Meslé, F. 1998. Causes of the Russian Mortality Crisis: Evidence and Interpretations. World Development. Vol. 26, No 6, pp. 1995-2011

Preston curve built on LE-$GDP PPP per capita as of 2015 and positions of Russia and Moscow in 2005, 2010, and 2015



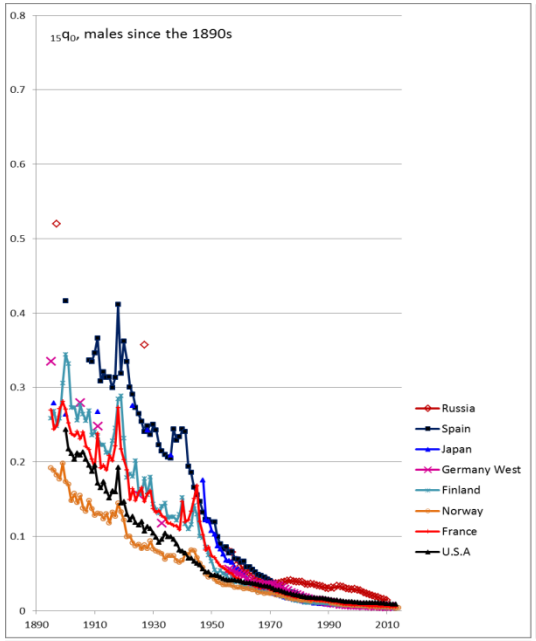
Russia - substantially below the curve. Deficits in 2015: -6.5 years (Rus), -4.9 years (Msk). The deficits have diminished by about 1/3 since 2005.

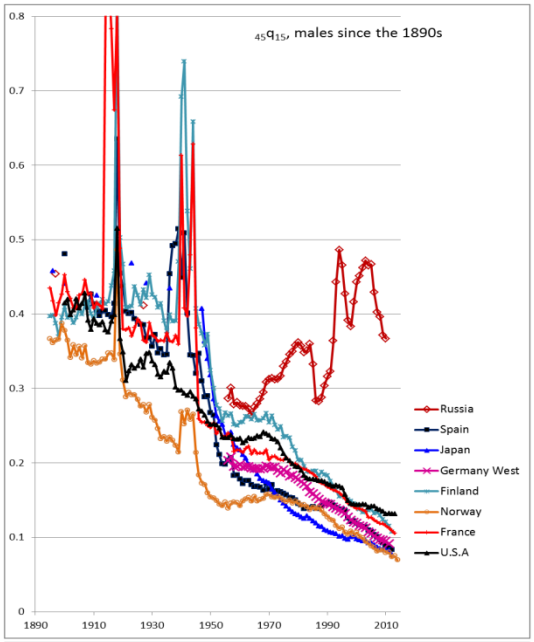
Sources: Manuscript by Shkolnikov, Andreev, Tursun-Zade and Leon, 2018

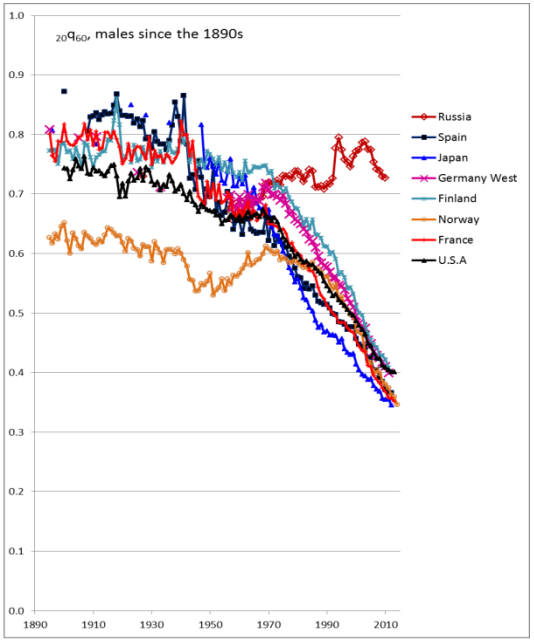
Crucial role of mortality at adult ages: probabilities of death in broad age ranges

$_{15}q_0$ $_{45}q_{15}$ $_{20}q_{60}$

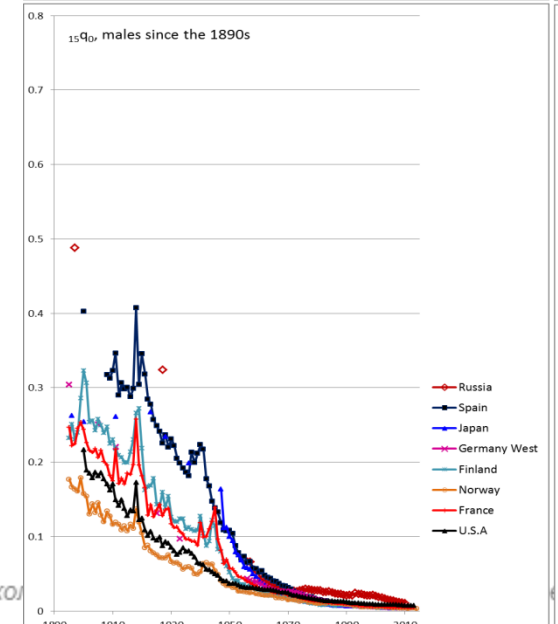
Men

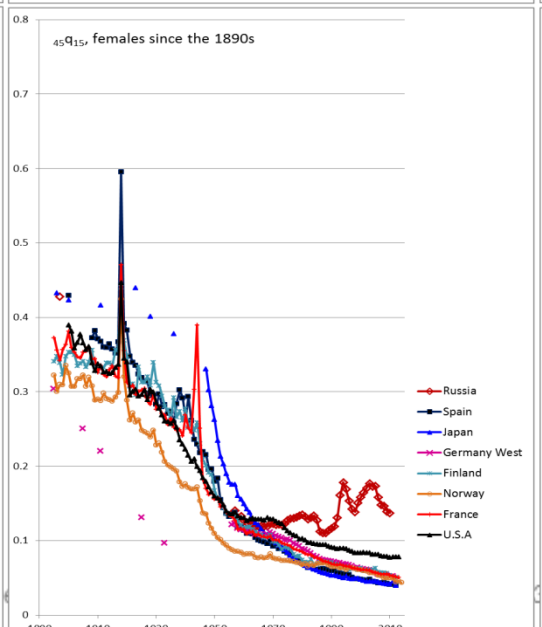


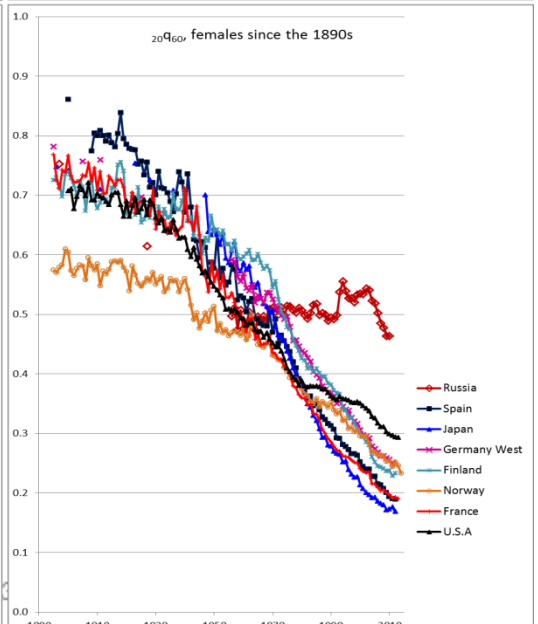




Women

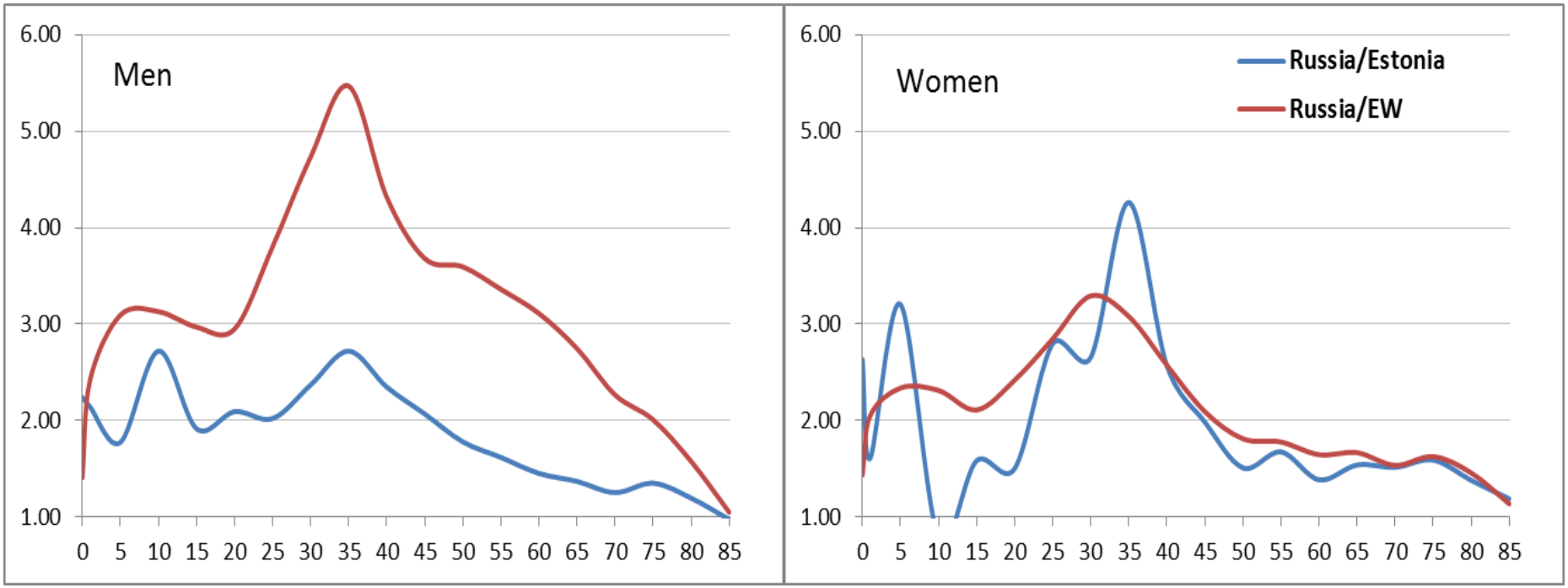






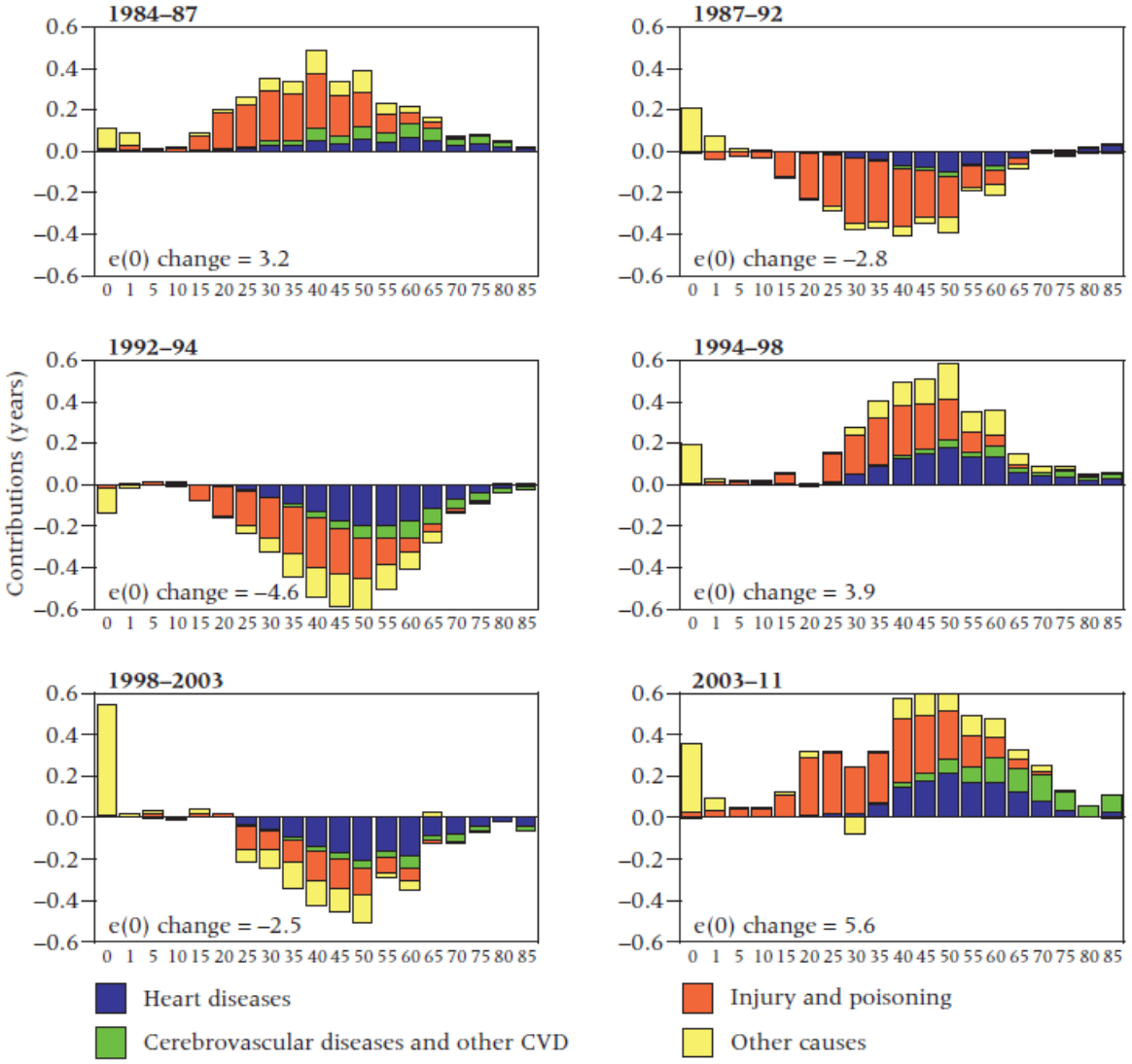
Source: HMD

Excess mortality in Russia as compared to Estonia and England and Wales. Death rates ratios in 2016-7



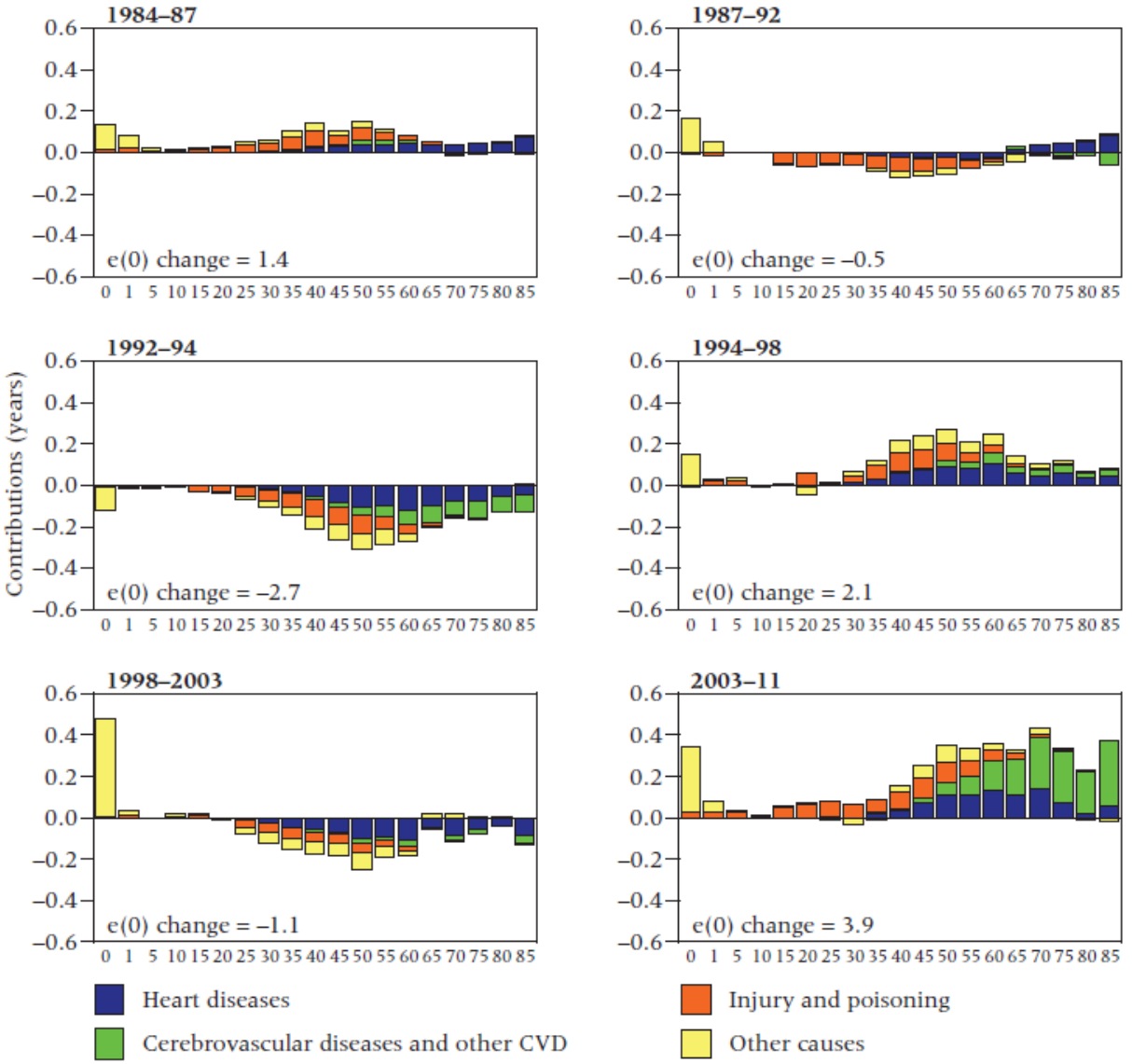
Russia – a rare combination of very high mortality among young adults (US blacks, Latin America) and very high CVD mortality at ages 60 to 80 (Eastern Europe).

Domination of working ages in LE changes (1). Decompositions of the male LE changes in 1984-2011



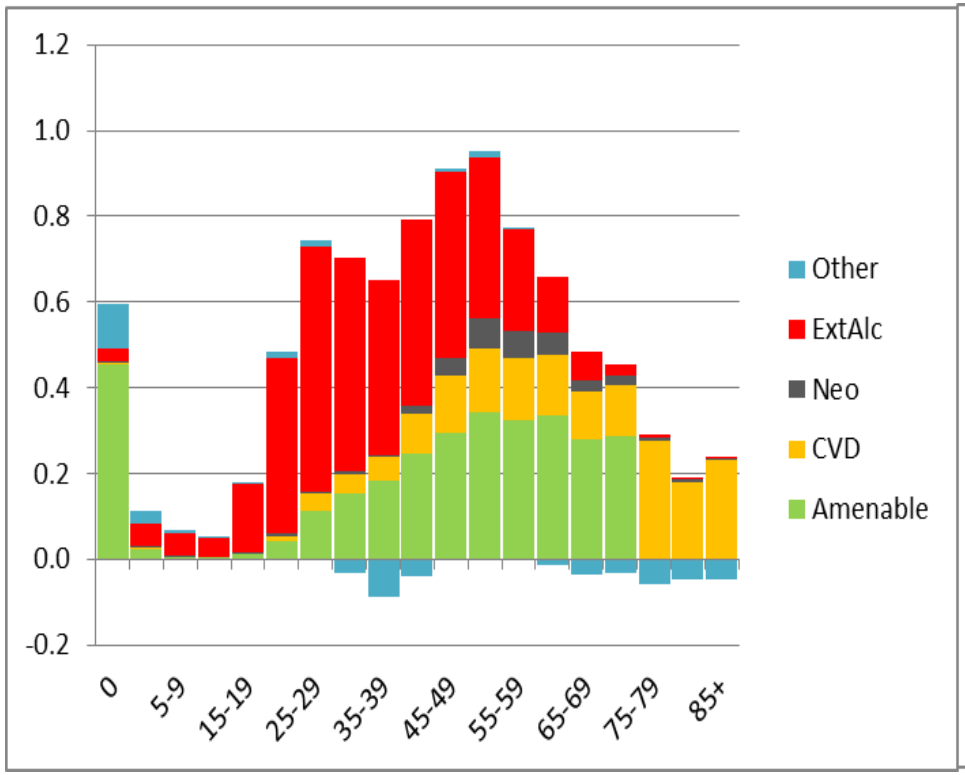
Grigoriev P., Melsé F., Shkolnikov V.M., Andreev E., Fihel A., Pechholdova M., Vallin J. 2014. The recent mortality decline in Russia: beginning of cardiovascular revolution? Population and Development Review, 40(1): 107-129

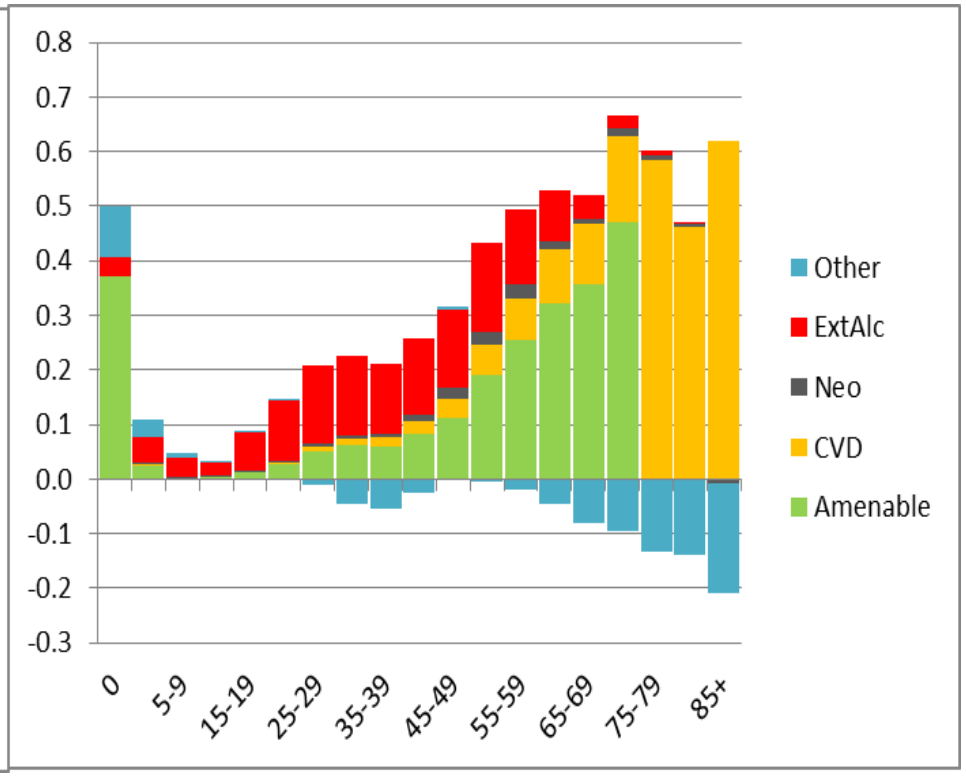
Domination of working ages in LE changes (1). Decompositions of the female LE changes in 1984-2011



Grigoriev P., Melsé F., Shkolnikov V.M., Andreev E., Fihel A., Pechholdova M., Vallin J. 2014. The recent mortality decline in Russia: beginning of cardiovascular revolution? Population and Development Review, 40(1): 107-129

Components of the life expectancy increase in Russia from 2005 to 2017

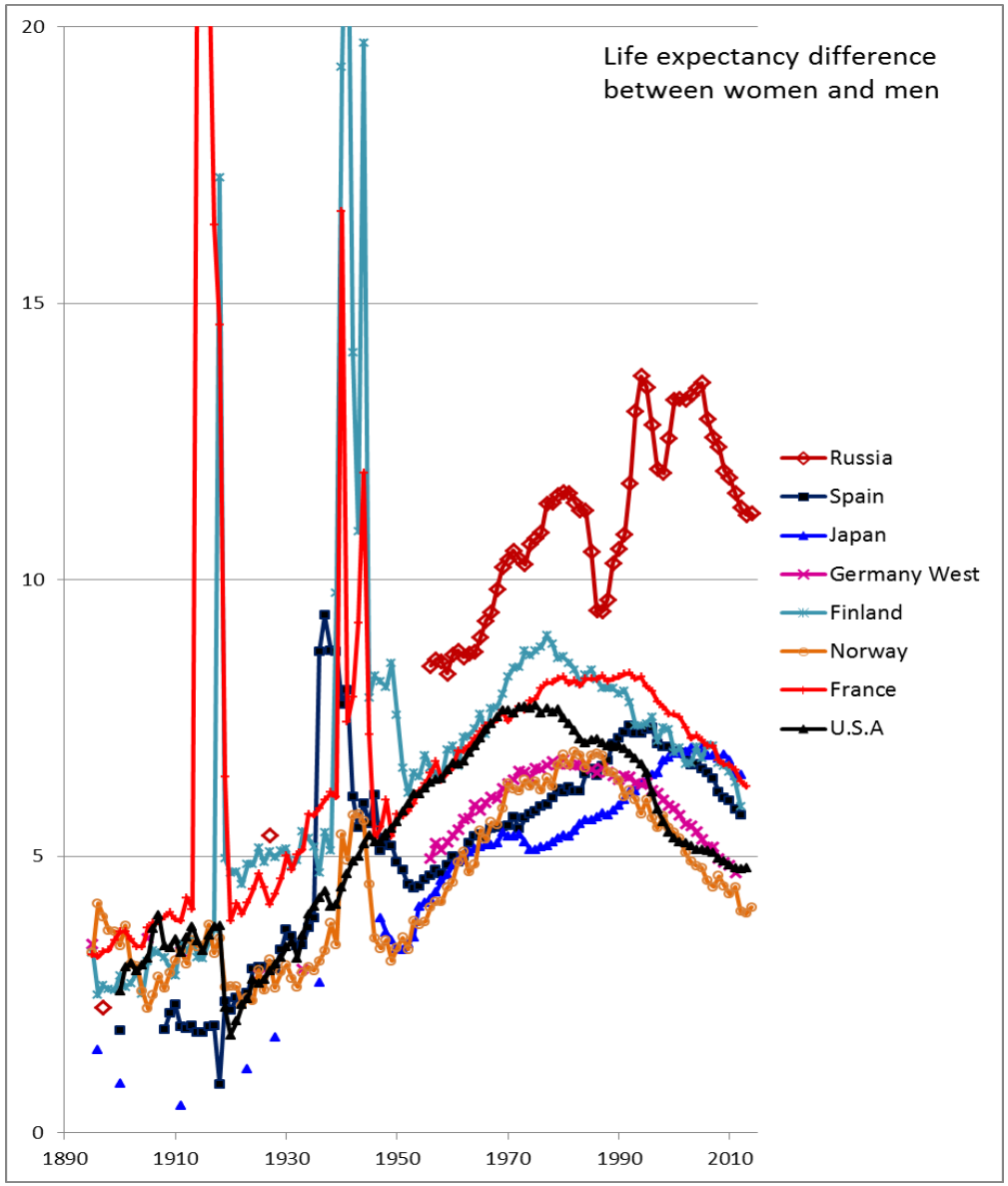




Recent changes: importance of mortality reductions at old ages esp. for women. Importance of progress in external+alcohol related and medically amenable causes for men and in medically amenable and CVD for women.

Decomp-Rus-2005-17.xlsx

A huge male disadvantage in length of life: 13 years in 1994 and 2003, 10 years in 2017

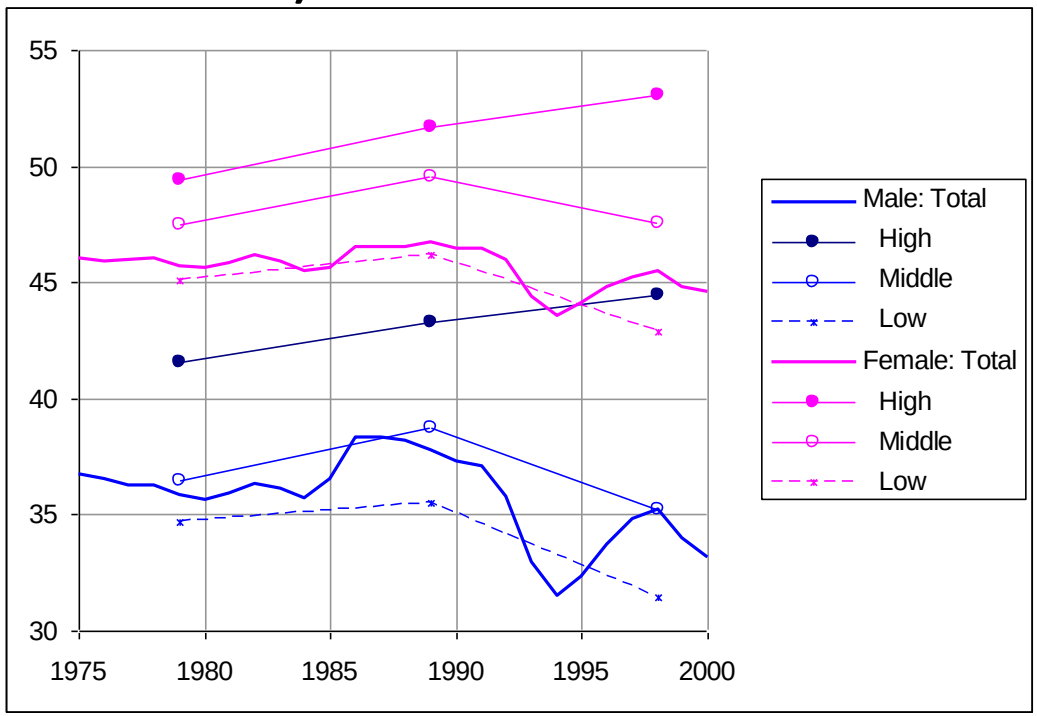


Source: HMD

Large educational gaps in LE in 1979,1989, and 1998

Life expectancy at age 30 by educational groups, year (unlinked estimates)

	Total	High	Middle	Low
Men				
1979	35.9	41.6	36.4	34.7
1989	37.9	43.3	38.8	35.5
1998	35.4	44.5	35.2	31.4
Women				
1979	46.9	49.4	47.5	46.5
1989	47.4	51.7	49.5	46.2
1998	46.0	53.1	47.6	42.9



Estimation of group-specific mortality from two unlinked sources can be biased due to the numerator-denominator bias.

Shkolnikov, V., Leon, D., Adamets, S., Andreev, E., Deev, A. 1998. Educational level and adult mortality in Russia: an analysis of routine data 1979 to 1994. Social Science and Medicine, Vol. 47, No 3, pp. 357-369

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. Journal of Epidemiology and Community Health, 60, pp. 875-881

Summary. Major mortality features in Russia

- Large scale and sustainable mortality reversal in 1965-2004
- Three very different segments of the trend: gradual deterioration (1965-84); great fluctuations (1985-2004); continuous improvement (2005+)
- Crucial role of working ages in the LE dynamics in 1965-2008 and a greater impact of old ages after 2008-9
- Large mortality excess among men compared to women
- A combination of very high mortality among young adults with high mortality at midlife and older ages
- High concentration of death in disadvantaged population groups

Why micro-level studies

Insufficiency of population-level data

Routine population-level data does not allow to observe many things. Large parts of necessary data are either not available or unreliable in the routine statistics: health and morbidity, smoking, alcohol consumption, nutrition, life styles, biomedical characteristics, nutrition, use of medical care …

Possible *ecological fallacy* that biases statistical relationships based on group averages. Logical fallacy in the interpretation of statistical results in an ecological study as acting at the individuals' level. EF is committed when a correlation observed at the population level is assumed to apply at the individual level.

Variability across individuals is greater than and may in many ways differ from variability of the same characteristics across the group-means.

Classic CVD and metabolic factors and mortality at ages 40+ in Lipid Research Clinics (LRC) and (MONICA) studies

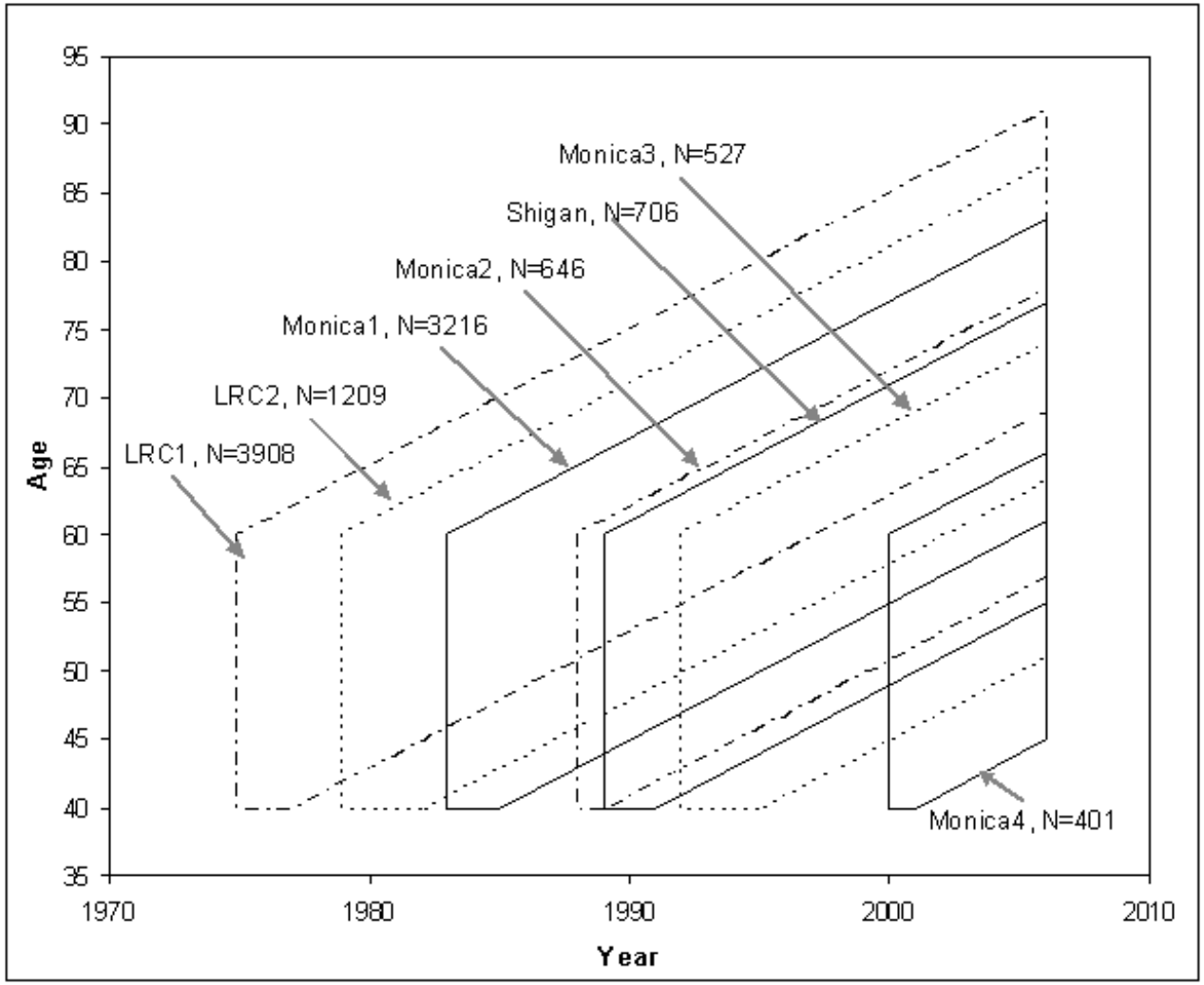
The LRC and MONICA cohort studies: a basis of the Soviet/Russian cardiovascular epidemiology

In the early 1970s, the US-USSR collaboration within the framework of the Lipid Research Clinics (LRC) program started. Later the USSR has joined the MONICA project of the World Health Organization. In Russia, the LRC centers were established in Moscow and Leningrad (St.Peterburg since 1991), the MONICA centers were established in Moscow and Novosibirsk.

Both the LRC and MONICA were implemented in a sequence of cohort studies that followed similar protocols of interviewing and biomedical testing.

The study questionnaires contained major health behaviors, self-reported health and diseases, certain cardiac symptoms, and socio-demographic characteristics. The medical tests' program included conventional cardiovascular risk factors: blood pressure, resting heart rate, blood lipids (total LDL and HDL cholesterol, triglycerides) and electrocardiography.

Shape of the pooled cohort data set of seven LRC and MONICA cohorts from Moscow on Lexis surface



Characteristics of the pooled data set (see more details on slide 34):

Period covered: 1975-2006

Baseline number of subjects: 10,613

Mean age at baseline: 47.3 years

Mean length of the follow-up: 16.9 years

Observed deaths: 4,906

Figure 1. Regions of observation for seven Muscovite cohorts on the Lexis diagram.

Analyses linking old-age mortality to risk factors

Data of the LRC and MONICA cohorts has been extensively used in research to examine long-term CVD and all-cause mortality effects of health behaviors, cholesterol, blood pressure and social status variables (such as education). The LRC-based studies: Dennis et al., 1993; Perova et al., 1995; Davis et al., 1994; Deev, Shestov et al., 1998; Plavinski, Plavinskaya, Klimov, 2003 and other studies by the same authors.

Although themes differ among the studies, they use one and the same statistical method. The Cox proportional hazard model links death hazard over follow-up periods with characteristics of individuals at the baseline.

Long-term CVD mortality effects of traditional risk factors in men from the Moscow LRC and MONICA cohorts

Our own estimates calculated from the pooled data of the seven epidemiological cohorts.

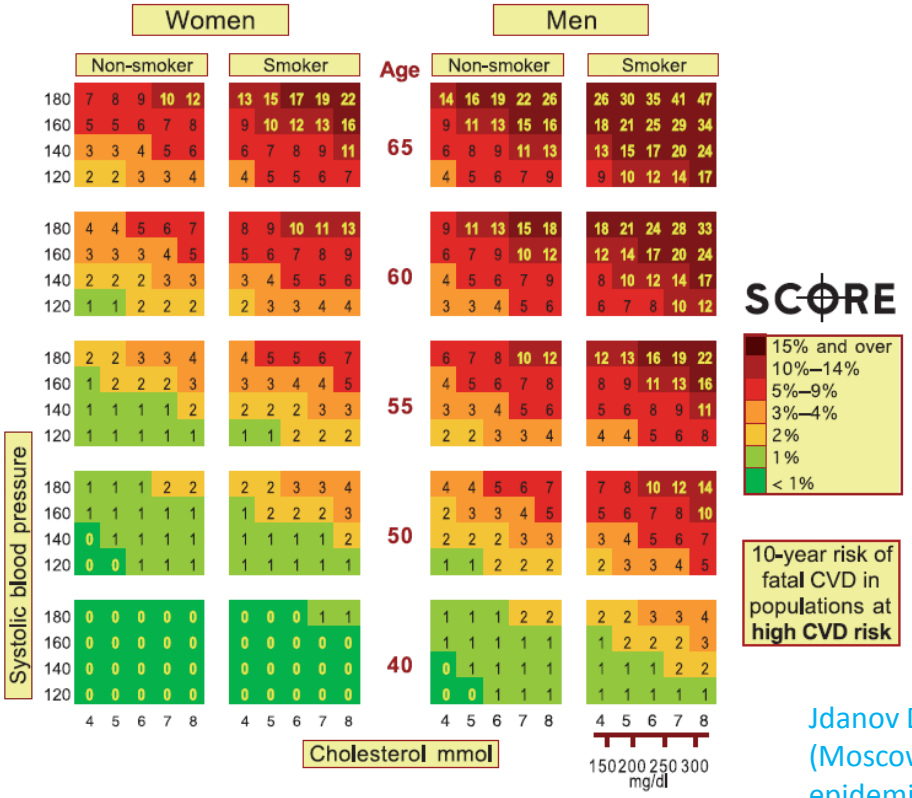
Table 2. Outcomes of the Cox regression with all explanatory variables present in its right-hand side and adjustment for age and cohort.

Factor	Category	Beta-coef.	95% CI		Hazard ratio	95% CI	
			Lower	Upper		Lower	Upper
Education	Low	0.460	0.388	0.532	1.584	1.473	1.702
	Middle	0.267	0.189	0.344	1.306	1.208	1.411
	High	0[ref.]	-	-	1[ref.]	-	-
Smoking	Never	0[ref.]	-	-	1[ref.]	-	-
	Former	0.233	0.143	0.323	1.263	1.154	1.382
	1-14 cigs.	0.501	0.397	0.605	1.651	1.488	1.831
	15-19 cigs.	0.694	0.606	0.782	2.002	1.833	2.187
	20+ cigs.	1.039	0.934	1.145	2.827	2.544	3.142
SBP	≤120 mmHg	0[ref.]	-	-	1[ref.]	-	-
	121-134 mmHg	0.146	0.059	0.233	1.157	1.060	1.263
	135-151 mmHg	0.428	0.340	0.516	1.534	1.405	1.675
	152+ mmHg	0.769	0.676	0.861	2.157	1.967	2.367
Heart rate	≤80 beats/min.	0[ref.]	-	-	1[ref.]	-	-
	>80 beats/min.	0.185	0.108	0.262	1.204	1.115	1.300
Total cholesterol	≤6.45 mmol/L	0[ref.]	-	-	1[ref.]	-	-
	>6.45 mmol/L	0.107	0.039	0.176	1.113	1.040	1.192
HDL cholesterol	≤1.04 mmol/L	0.081	0.014	0.149	1.085	1.014	1.160
	>1.04	0[ref.]	-	-	1[ref.]	-	-
BMI	≤29.9 kg/m^2	0[ref.]	-	-	1[ref.]	-	-
	>29.9 kg/m^2	0.133	0.048	0.218	1.142	1.050	1.243

The European CVD SCORE for Russia: a recent use of the LRC-MONICA data

The Framingham Risk Score in the U.S. and the European CVD SCORE combine traditional cardiovascular biomarkers with demographic characteristics to estimate an individual risk.

Ten-year probability of dying from CVD for European women and men aged 24 to 68 at baseline in populations of higher CVD risk.

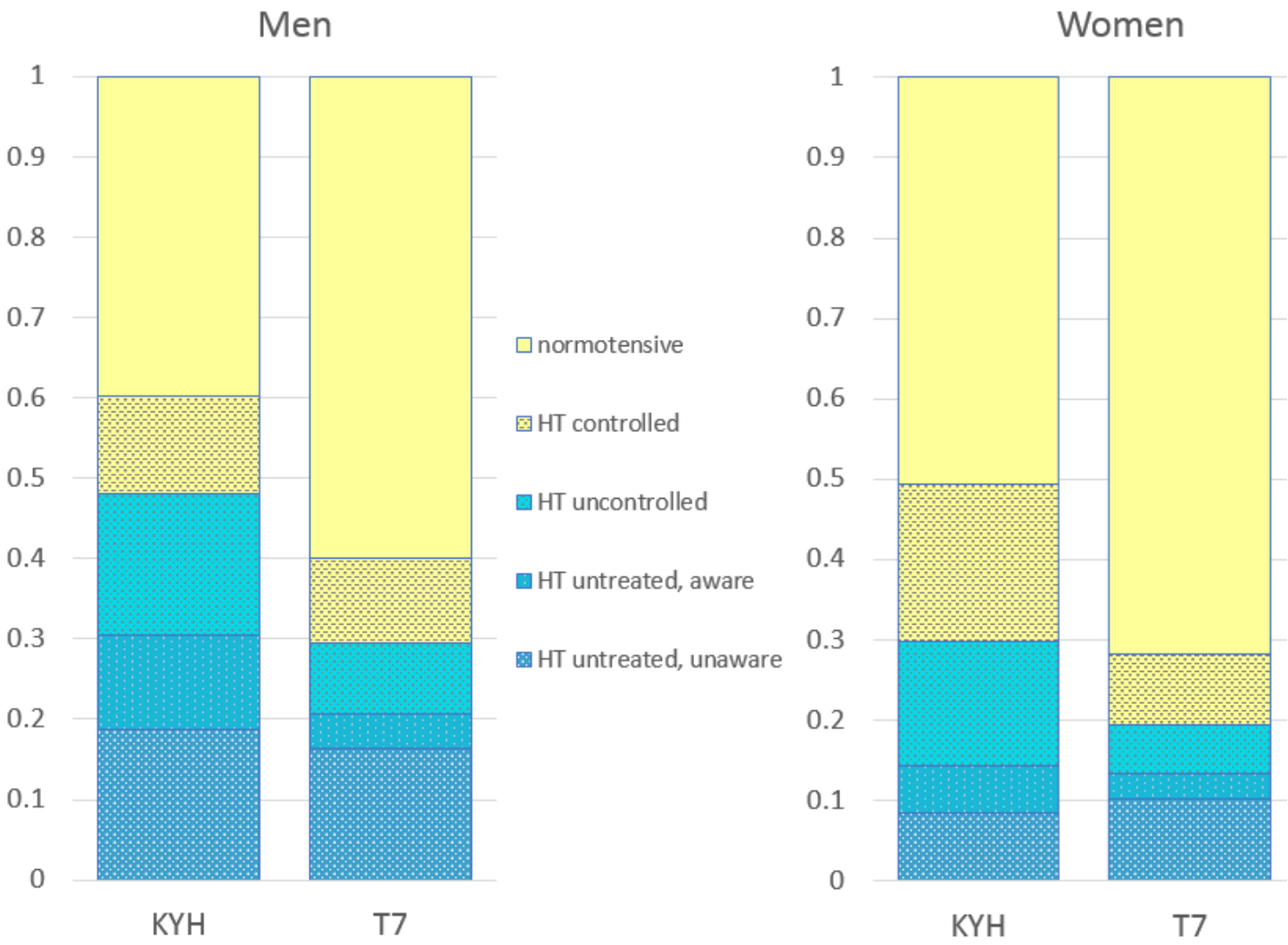


In the SCORE (Conroy et al., 2003), individual ten-year hazard is estimated from pooled cohort follow-up data on 205 thousand individuals (2.7 mln person-yrs of follow-up, nearly 8 thousand CVD deaths). 10-year CVD death hazard for an individual i is being estimated according to the proportional hazard model:

$$h_i(t) = h_0(t)e^{\beta_1 x_{i1} + \ldots + \beta_k x_{ik}}$$

Jdanov D.A. et al. 2014. Recalibration of the SCORE risk chart for the Russian (Moscow-St. Petersburg) population using pooled data from seven epidemiological cohorts. European Journal of Epidemiology. 29: 621-628

Age-standardised proportions by hypertension class by sex: Know Your Heart – vs Tromsø-7

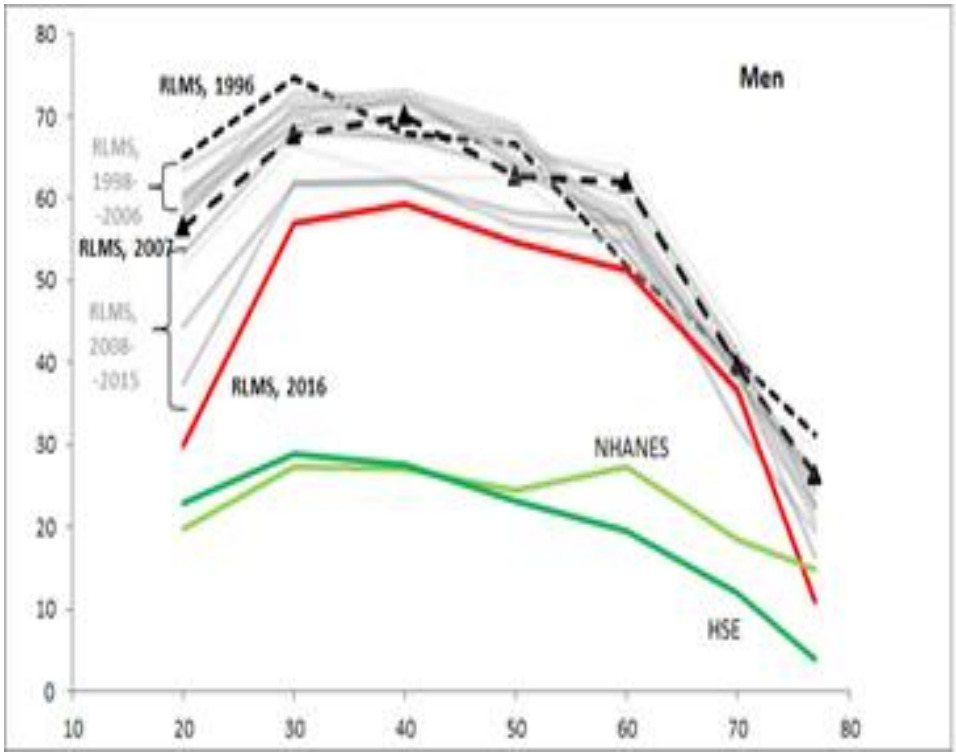


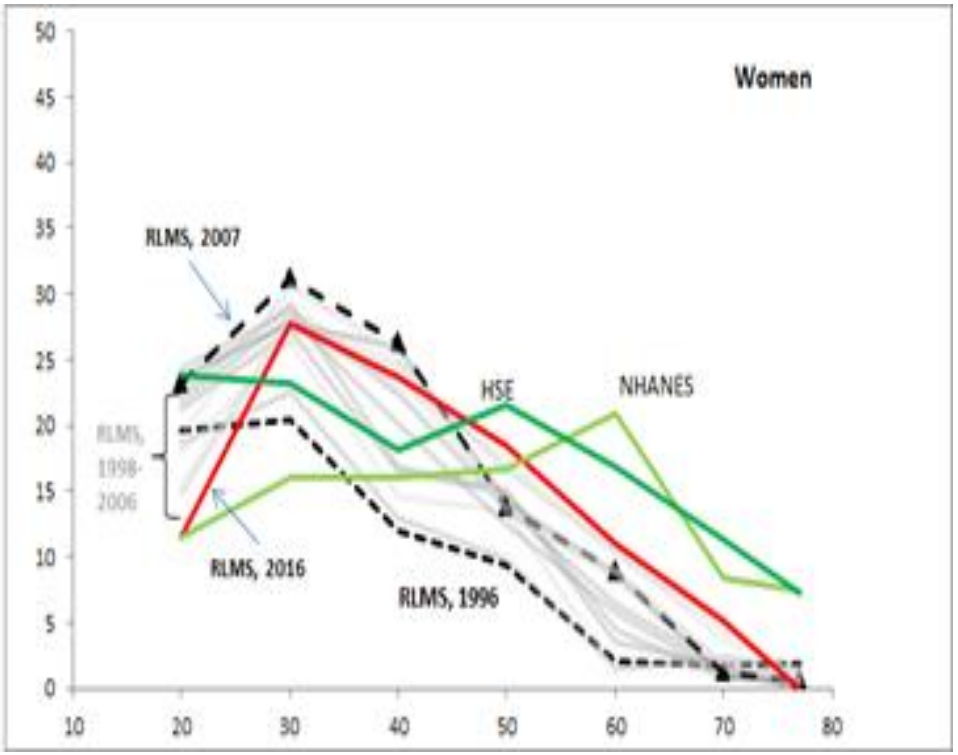
Micro-level studies on smoking

Hamphrey Boggart (1899-1957) The best American actor of the 1930s-50s. Main character in the “Casablanca”. Heavy chain smoker. Died from esophagus cancer.

Yul Brinner (1920-1985) Famous American actor and producer of Russian origin. Main character in the “Magnificent seven”. Heavy smoker. Died from lung cancer.

Age-specific prevalence of smoking by round of RLMS (1996-2016) as compared to NHANES (USA) and HSE (England)



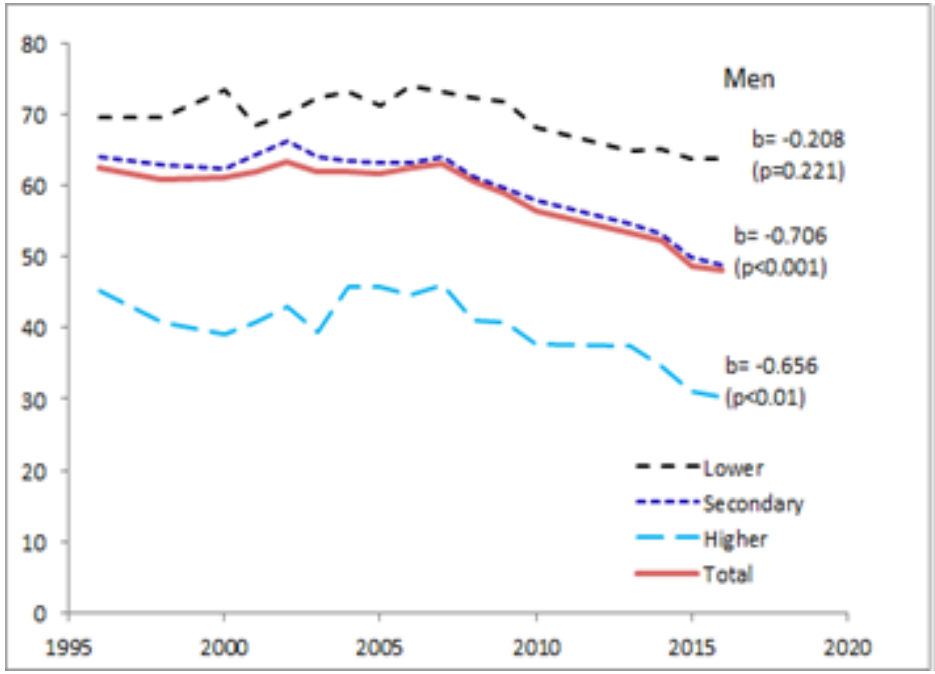


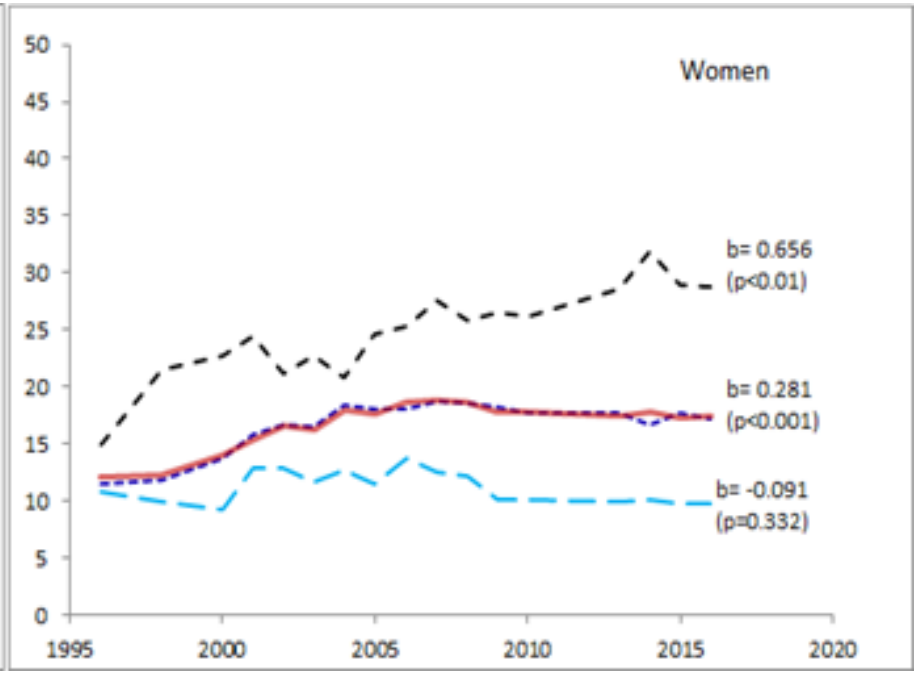
Shapes. Men: formed by long existing high smoking regime and by selective survival. Women: the shape is determined by long existing regime of low smoking and its rise during the 1990s.

Men: No dynamics in 1996-2007 and a substantial reduction in 2008-17.

Both sexes: very substantial drops at ages 20-25.

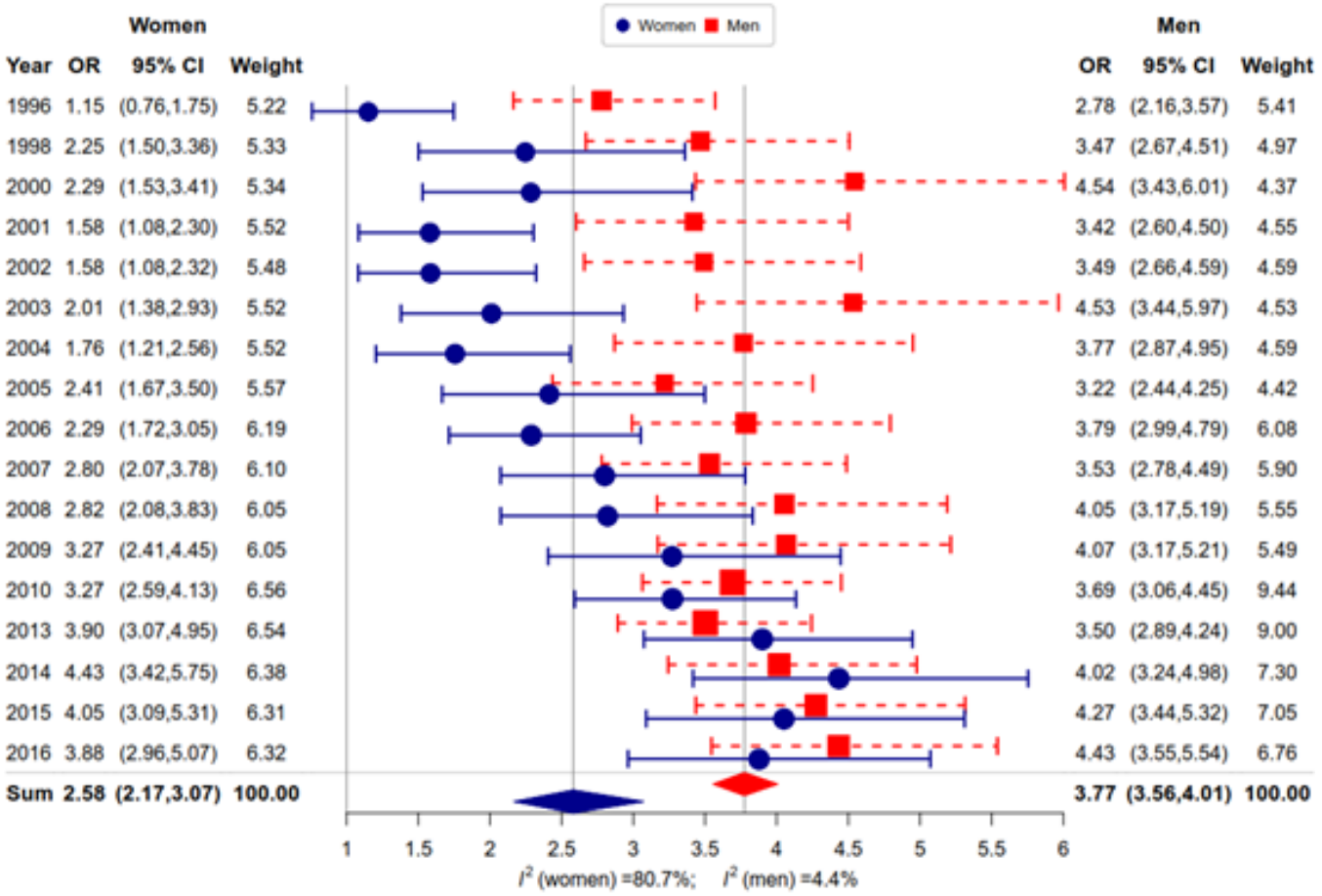
Trends in the age-standardized prevalence of smoking by sex and education group in 1996-2016 according to the RLMS series





Men. Large initial gap persists. Statistically significant decline since 2008.
Women. Initially small gap widens. Contrasts between high education and the two lower levels.
Reduction of the male smoking by about 10% in 2008-17 could produce a reduction of CVD deaths by 62 thousand (or 8% of the observed decrease).

Odds ratio of smoking between high and low education in the RLMS series in 1996-2016. Comparison of men and women



Persistently high OR among men and an impressive rise among women from 1-1.5 to 4-4.5

Methodological considerations in studying premature male deaths at working ages in the 1990s

Enormous male mortality at working ages results in probabilities of survival from 20 to 60 of only 50%. What factors and circumstances are responsible for the phenomenon?

Cohort LRC data that links alcohol intake with deaths occurring many years or even decades later at old ages shows only very moderate risk elevation of about 20% in response to high alcohol consumption (Deev et al., 1998).

Scholars should take in account that many deaths at these ages:

- happen unexpectedly (without preceding history of disease) and quickly after an intensive exposure to severe risks;
- are related to alcohol abuse, violence and other socially unwelcomed phenomena that many people tend to hide;
- many of deceased belong to very poor and/or heavy drinking groups. Such people are likely to be under-represented in epidemiological cohorts.

These features lead to idea of the mortality follow-back or verbal autopsy method and to the case-control design of the study.

Alcohol and male mortality at ages 25-54 in the Izhevsk Family Study

Addressing the explosion of alcohol-related death at working ages in the 1990s. First implementation of the retrospective case-control design in 1998-99

UNDP Project «Policies for control on population mortality in transitional period» with the data collection period 1998-99. **The first use of the *retrospective case-control design* for studying mortality in Russia.**

The method addresses short exposure-outcome sequences, characteristic of deaths from many alcohol-related and external causes at working ages.

Use of proxy respondents allows to collect data on sensitive issues.

The method captures deaths in all population groups including very poor and alcohol-dependent people.

Weaknesses: it might be difficult to recruit very poor and marginal people as controls; it is difficult to validate some information reported by proxy respondents.

Design of IFS 1

- Cases (1750 males, age 25-54)
  - Males, who died at ages 25 to 54 in Izhevsk from Oct 2003 to Sept 2005
  - Interviewing of proxy respondents (wives and close relatives) living in the same household.
  - Interviewing both controls and their proxy respondents
- Controls (1750 males, the same age structure as for the cases)
  - Men living in Izhevsk
  - Random choice from an electoral register
  - Interviewing of the men as well as proxy respondents
- Collection of additional data on cases and controls
  - Causes of death from medical death certificates
  - Forensic data on post-mortem concentration of alcohol in blood
  - Information about being registered as a narcology patient

Leon et al., 2007

Hazardous alcohol drinking in IFS 1. An assessment of hazardous drinking

The Izhevsk Family Study 1 was focused on men aged 24 to 54. They were interviewed in 2003-5. In addition, proxy informants (their spouses/partners or other close relatives living in the same household) were interviewed. These proxy-data are less affected by the tendency for under-reporting.

The IFS questionnaire included questions highlighting hazardous drinking during the last year:

- Having drunk surrogates (surrogates = alcoholic substances not intended to be drunk as beverages = medical tinctures or substances for hygiene with high concentration of pure ethanol);

- Having been in *zapoi* (periods of continuous drunkenness lasting several days during which an individual is withdrawn from normal life);

- Frequent hangover (once a month or more often);

- Frequent drinking of vodka (every day or nearly every day)

Prevalence of components of hazardous drinking in working age men in Izhevsk

Over past year	2003-5 (25-54 yrs)	2008-9 (30-59 yrs)
Spirits daily or almost every day	3%	4%
Hangover 2+ / week	4%	3%
Excessively drunk* 2+ / week	4%	4%
Non-beverage alcohol	6%	6%
Zapoi	10%	11%

* Specified in questionnaire as “Перепивает”

N ~ 1500

Concentration of hazardous drinking in disadvantaged groups (IFS 1)

Association between education and hazardous drinking (age-adjusted ORs) men aged 25-54

	Incomplete secondary	Secondary	Higher
Ever consumed surrogates	12.8 (5.6, 12.9)	3.9 (1.9, 7.7)	1 (referent)
Had been in zapoi	9.4 (4.5, 19.7)	4.0 (2.3, 7.0)	1 (referent)
Frequent hangover	5.8 (2.0, 11.3)	3.1 (2.0, 5.0)	1 (referent)
Frequent spirits drinking	1.6 (0.6, 4.7)	1.1 (0.6, 2.0)	1 (referent)

Similar strongly elevated death odds related to hazardous drinking were found among the unemployed and among the poor.

Tomkins et al., 2006

Strong association of alcohol with mortality by cause Men aged 25-54, Izhevsk, 2003 - 5

Cause of death	Number of deaths	Hazardous drinking (proxy report)	
		OR*	(95% CI)
Circulatory disease	486	**4.1**	(3.2, 5.3)
Acute alcohol poisoning	78	**18.9**	(10.7, 33.3)
All causes	1446	**5.5**	(4.5, 6.6)

* OR adjusted for age, smoking and education

Source : Leon, Shkolnikov, McKee, Kiryanov, Andreev, IJE, 2010

Impact on male death toll

Leon et al, Lancet (2007), 369 :2001-2009

Hazardous drinking accounts for

43% of deaths

among working age (25-54) men in Izhevsk in the early 2000s

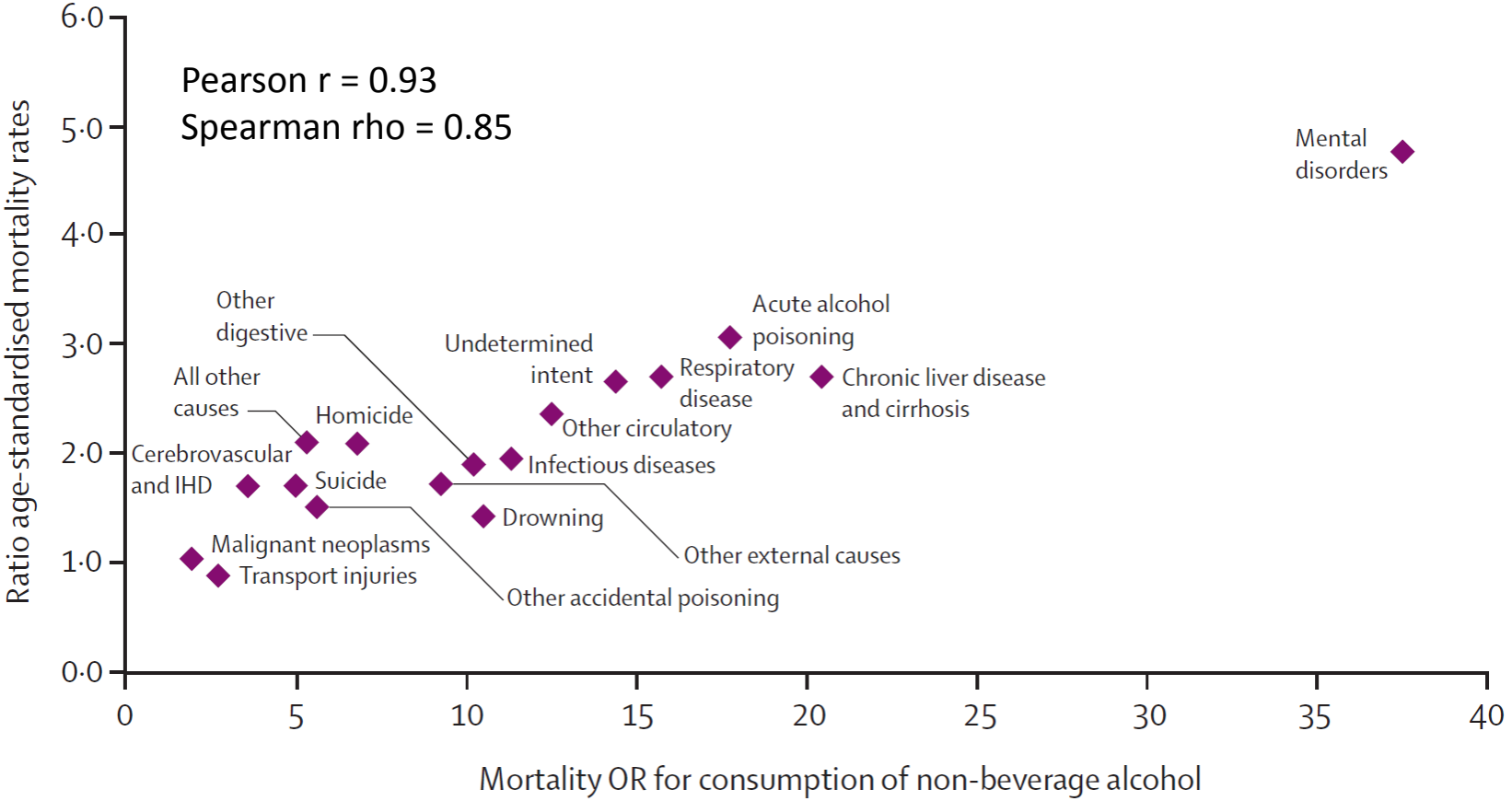
170,000 excess male deaths per year

applied to Russia as a whole

Note : 2009 study from Barnaul, Siberia suggests more than half of all deaths attributable to alcohol

[Zaridze et al Lancet (2009), 373 :2201-2214]

Cause-specific mortality odds ratios for non-beverage alcohol drinkers in IFS compared to relative changes in mortality (1991/94) in men aged 25-54 years in Russia



Source : Leon, DA et al *Lancet 369:2001-2009, 2007*

Handgrip strength in the Moscow study Stress Aging and Health (SAHR)

Oksuzyan A, Demakakos P, Shkolnikova M, Thinggaard M, Vaupel JW, Christensen K, Shkolnikov V.M. 2017. Handgrip strength and its prognostic value for mortality in Moscow, Denmark, and England. PLoS ONE 12(9): e0182684

Data sources for an international GS comparison

Russia: The SAHR baseline survey of 2006-2009. Muscovites aged 55+ (69 years on average).

Denmark: the study of Middle Aged Danish Twins (MADT) and the Longitudinal Study of Aging Danish Twins (LSADT). Data collected in 1998-99 and 2001.

England: The English Longitudinal Study of Aging (ELSA), wave 2 conducted in 2004-5.

The same device and the same protocol were in use in all these studies.

The Smedley's Dynamometer (TTM, Japan or Scandidact, Denmark). After adjusting the device (grip gauge) to suit the respondent's hand and positioning the respondent correctly, the respondent was asked to squeeze the dynamometer as hard as (s)he could for a couple of seconds. Three values were recorded for each hand, starting with the non-dominant hand alternating between hands.

Are older Russians weaker than their counterparts in other countries ? (SAHR)

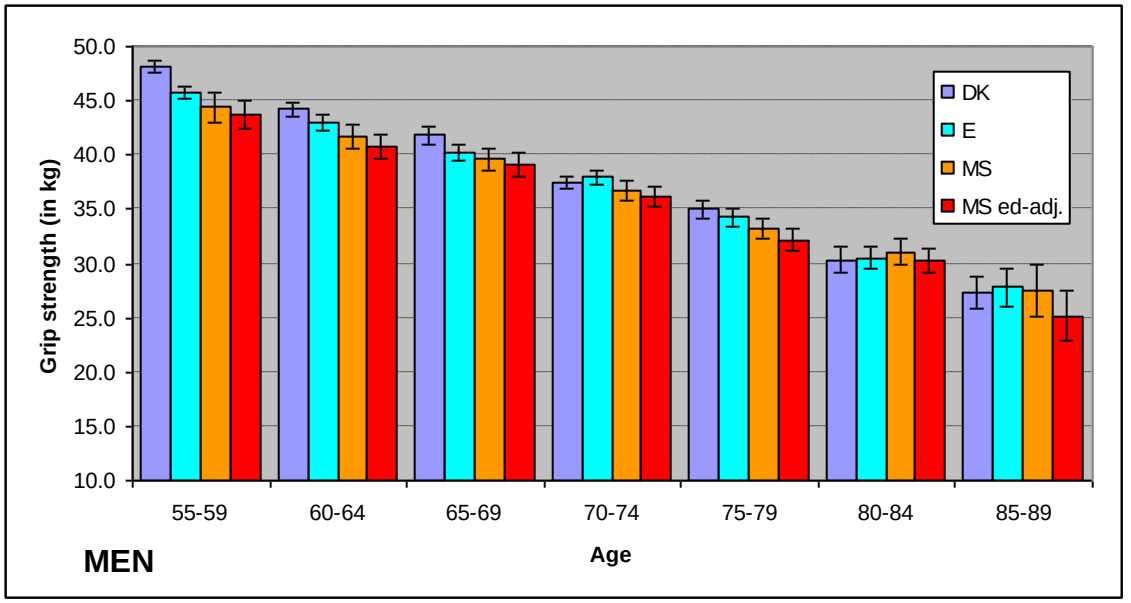
The age-adjusted GS values:

Males

DK : 41.7 (±0.1) kg
ENG: 40.5 (±0.2) kg
MSK: 38.7 (±0.2) kg

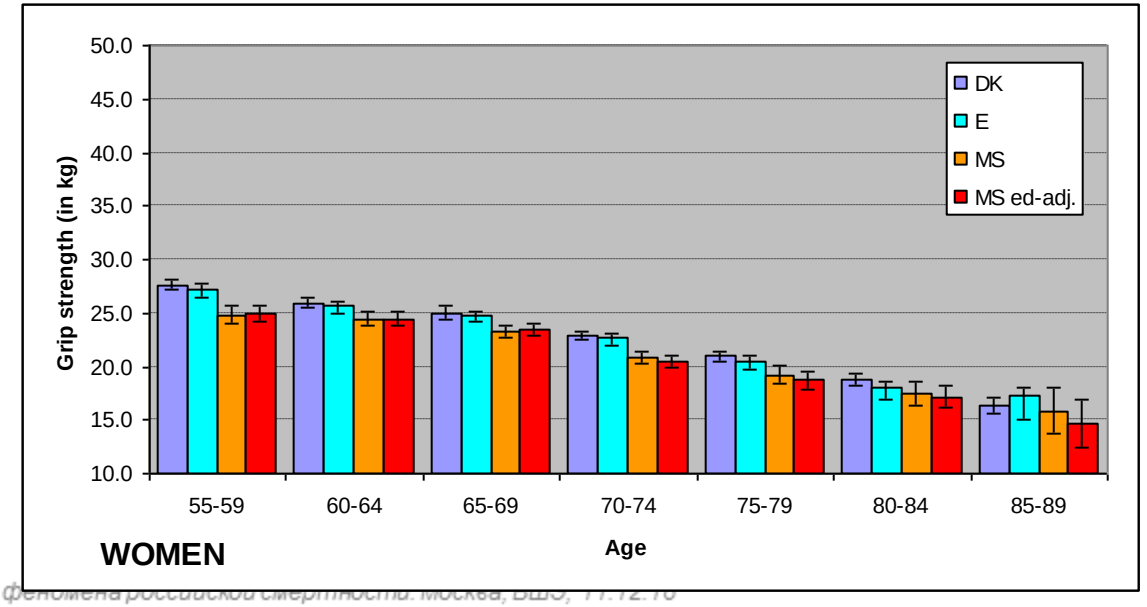
Females

DK : 24.6 (±0.1) kg
ENG: 24.4 (±0.2) kg
MSK: 22.6 (±0.2) kg



Muscovites are somewhat weaker than Danes and English.

The international SHARE (Survey on Health Aging and Retirement in Europe) data (Andersen-Ranberg et al., 2009) show a north-south GS divide in Europe with higher GS in Scandinavia and Germany compared to Italy, Spain, and Greece. GS in Moscow is comparable to that in Italy.



Mortality hazard ratios per 1 kg increase in GS in Russia, Danish, and English samples

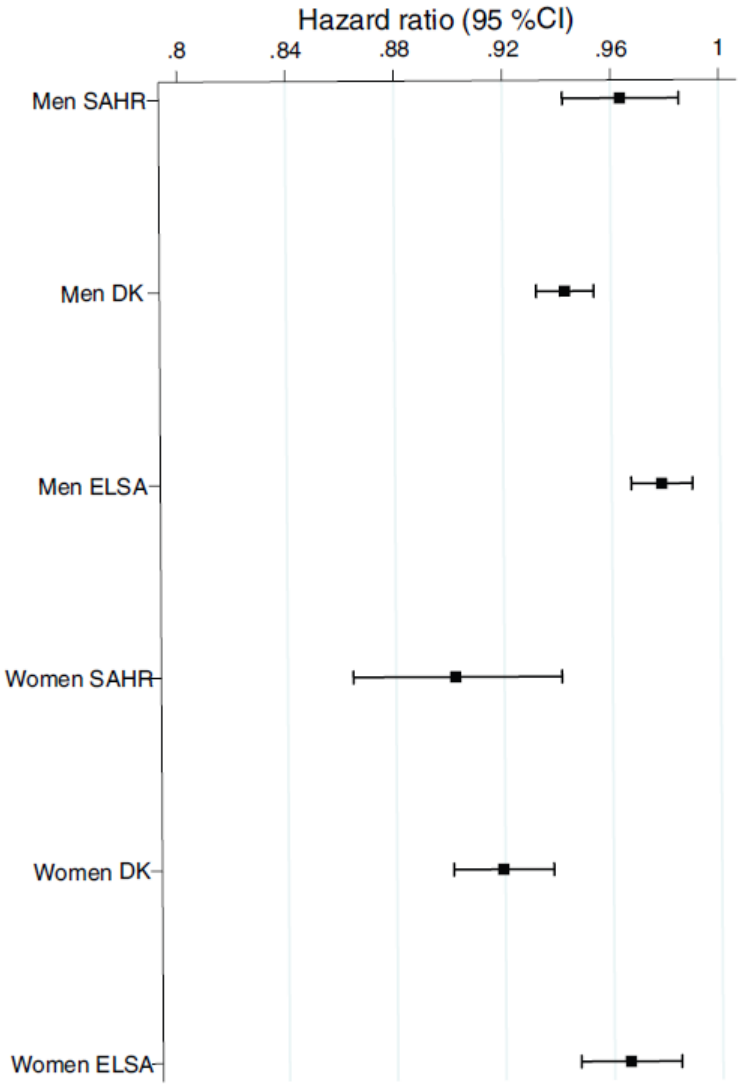


Fig 2. Hazard ratios for grip strength per 1-kg increase in SAHR, MADT and LSADT, and ELSA.

https://doi.org/10.1371/journal.pone.0182684.g002

Health and mortality among men and women and their determinants in SAHR

Oksuzian A., Shkolnikova M., Vaupel J.W. et al 2015. Sex differences in biological markers of health in the study of Stress, Aging and Health in Russia. PLOS ONE DOI:10.1371/journal.pone.0131691

Shkolnikova MA, Ildarova RA, Jdanov DA, Shalnova SA et al Ventricular arrhythmia in Moscow: its prevalence and links to mortality and to the mortality gap between men and women. In press 2018

Male-female differences in the age-standardized prevalence of poor reported health and physical functioning

Health indicator	Men (%)	Women (%)	p
Poor physical functioning	13.0	20.7	<0.001
Poor self-rated health	13.6	21.8	<0.001

Male-female differences in the age-standardized prevalence of high-risk levels of biomarkers

	Men (%)	Women (%)	p
Behavioral			
Present and past smoking	68.4	22.0	<0.001
Past alcohol problems	24.0	1.5	<0.001
Alcohol consumption > 3 times/week	25.3	4.0	<0.001
Cardiovascular and metabolic			
Total cholesterol	29.3	49.4	<0.001
HDL	31.6	16.7	<0.0001
Triglycerides	10.2	9.3	>0.05
Obesity	28.9	44.0	<0.001
Waist circumference	32.4	59.4	<0.001
Hypertension grade II	49.1	46.8	>0.05
Glycosylated Hb	15.5	16.7	>0.05

Male-female differences in the age-standardized prevalence of high-risk levels of biomarkers (2)

	Men (%)	Women (%)	p
Low grade inflammation			
CRP	28.8	29.1	>0.05
IL-6	19.5	20.6	>0.05
Fibrinogen	20.3	20.1	>0.05
ECG			
Major Q-wave	6.4	4.1	<0.05
AF	4.4	3.2	>0.05
LVH-ST	3.2	1.3	<0.05

Biomarkers and reported health

Obesity and metabolic problems are more prevalent among women. More acute and life threatening heart conditions and behavioral risks are more prevalent among men.

Biomarkers do not support female disadvantage in the reported health and physical performance.

Variables that differ between men and women are not associated or weakly associated with the health outcomes.

Regression analysis shows that behaviors and biomarkers can explain only a minor part of the male-female difference in reported health.

Attenuation of the male-to-female mortality ratio by different groups of variables in PH models

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Sex	*2.193****	*1.932****	*2.185****	*2.084****	*1.974****	*1.681****
	(1.788 - 2.689)	*(1.564 - 2.386)*	*(1.759 - 2.715)*	*(1.693 - 2.565)*	*(1.600 - 2.435)*	*(1.332 - 2.123)*
Smoking		2.058****				2.079****
		(1.600 - 2.647)				(1.607 - 2.689)
Obesity			1.001			1.068
			(0.805 - 1.245)			(0.854 - 1.335)
Grade II hypertension			1.136			1.104
			(0.913 - 1.412)			(0.884 - 1.380)
Total cholesterol			1.000			
			(0.809 - 1.236)			
Triglycerides			0.897			
			(0.595 - 1.354)			
History of MI				1.208		1.125
				(0.920 - 1.586)		(0.853 - 1.484)
History of stroke				1.549***		1.562***
				(1.162 - 2.065)		(1.168 - 2.087)
ST depression				1.461***		1.428**
				(1.110 - 1.922)		(1.080 - 1.887)
VPC =10/hour					1.071	1.048
					(0.829 - 1.384)	(0.811 - 1.354)
Polymorphic VPC					1.247**	1.193
					(1.005 - 1.549)	(0.958 - 1.484)
VPC runs					1.822****	1.859****
					(1.325 - 2.505)	(1.342 - 2.575)
Couplets					1.153	1.151
					(0.885 - 1.501)	(0.882 - 1.503)
N	1,732	1,732	1,726	1,727	1,729	1,720
Reduction of M/F HR compared to Model 1, %	-	*11.9*	*0.4*	*5.0*	*10.0*	*23.4*

To be continued in 2019 …

Additional

Domination of working ages in LE changes (1)

Men

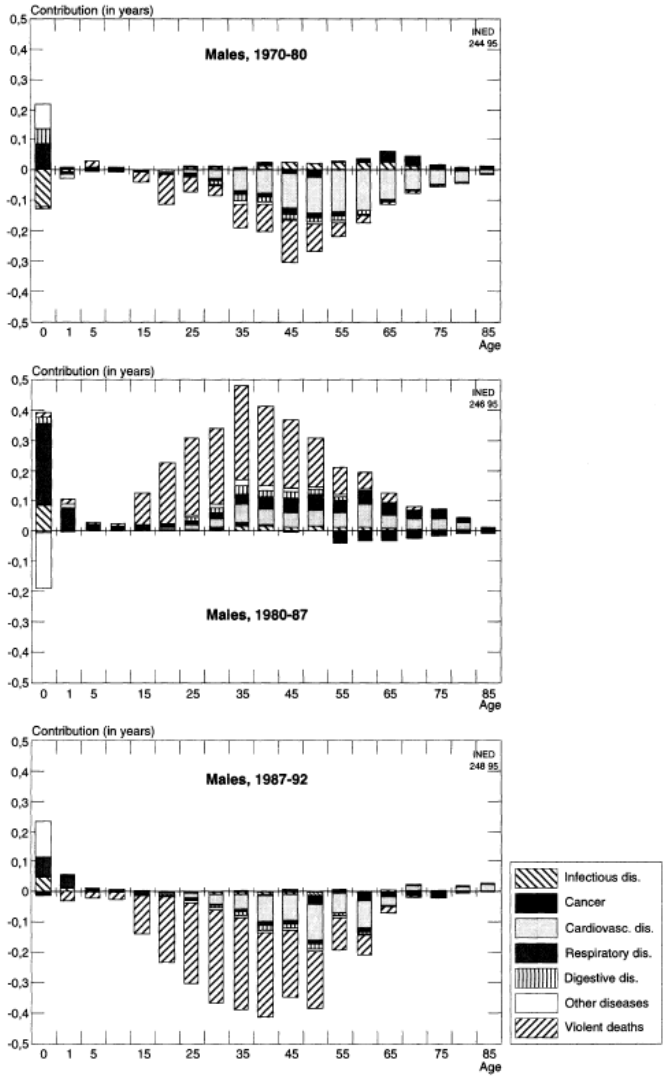


Figure 6a. – Cause components of changes in male life expectancy during three periods, by age

Women

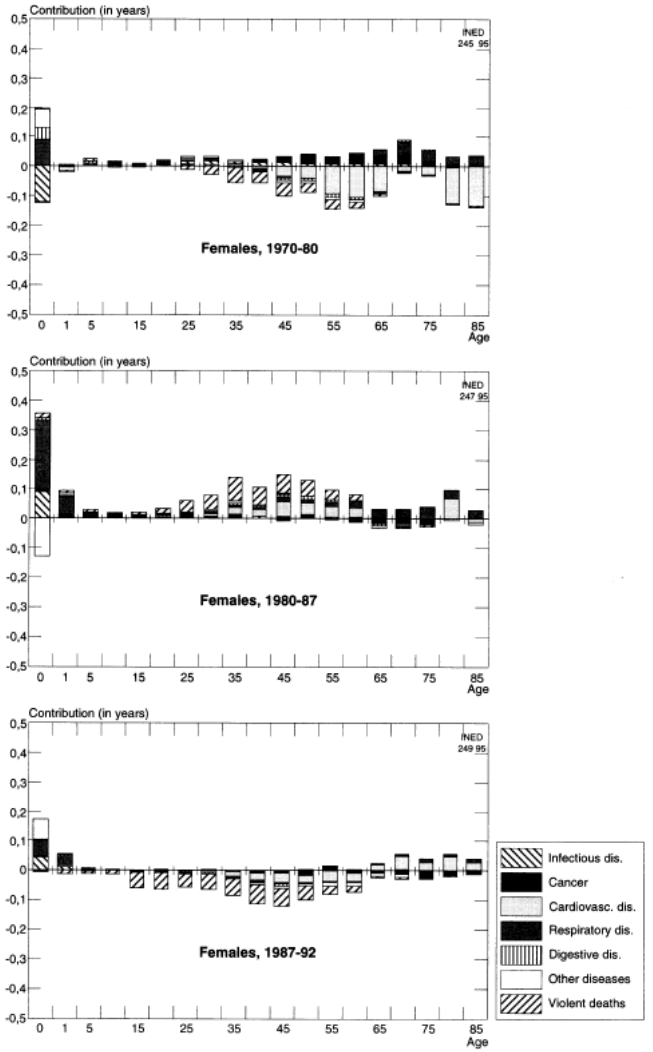


Figure 6b. – Cause components of changes in female life expectancy during three periods, by age

Shkolnikov, V.M., Meslé, F., Vallin J. 1996a. Health crisis in Russia I. Recent trends in life expectancy and causes of death. Population: An English Selection, 8: 123-154

Medically amenable causes of death

COD list by Nolte and McKee (2009)

CoDs	Ages		Ages
1 Intestinal infections	0-14	18 All respiratory diseases (excl. pneumonia, influenza)	1-14
2 Tuberculosis	0-74	19 Influenza	0-74
3 Other infections (diphtheria, tetanus, septicaemia, poliomyelitis)	0-74	20 Pneumonia	0-74
4 Whooping cough	0-14	21 Peptic ulcer	0-74
5 Measles	1-14	22 Appendicitis	0-74
6 Malignant neoplasm of colon and rectum	0-74	23 Abdominal hernia	0-74
7 Malignant neoplasm of skin	0-74	24 Cholelithiasis and cholecystitis	0-74
8 Malignant neoplasm of breast	0-74	25 Nephritis and nephrosis	0-74
9 Malignant neoplasm of cervix uteri	0-74	26 Benign prostatic hyperplasia	0-74
10 Malignant neoplasm of cervix uteri and body of uterus	0-44	27 Maternal death	0-74
11 Hodgkin's disease	0-74	28 Congenital cardiovascular anomalies	0-74
12 Leukaemia	0-44	29 Perinatal deaths, all causes, excluding stillbirths	0-74
14 Diabetes	0-49		
15 Epilepsy	0-74	*Ischemic heart disease: 50% deaths*	*0-74*
16 Chronic rheumatic heart disease	0-74	*Cerebrovascular diseas: 50% deaths*	*0-74*
17 Hypertensive disease	0-74		

Nolte, McKee 2008: "… conditions such as bacterial infections, treatable cancers, diabetes, cardiovascular and cerebrovascular disease, and complications of common surgical procedures. We also included ischemic heart disease (IHD); however, in line with accumulating evidence suggesting that only up to half of premature mortality from IHD may be potentially amenable … "

List-avidable-causes.xlsx