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Mortality in Russia: Microanalysis

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Abstract

The paper studies determinants of Russian adult mortality controlling for individual and household heterogeneity. We utilize twelve rounds of the Russian Longitudinal Monitoring Survey spanning the period of 14 years to study determinants of adult mortality. Survival analysis is the main methodology employed. The results are original in several respects. We find empirical support to the importance of relative status measured in non-income terms in shaping mortality hazards while income-measured relative position is confirmed to be statistically insignificant. We find evidence on the influence of labor market behavior, and sectoral and occupational mobility in particular, on longevity. The health detrimental role of smoking is found to be comparable to the role of excess alcohol consumption which is novel in the Russian context where the influence of smoking is downplayed in comparison to the alcoholism. Finally, we find no micro evidence in support to the regional data result underlying Treisman (2008) political economy story.

Keywords: Mortality, Relative Deprivation, Survival Analysis, Transition, Russia

JEL Classification: J1, J10, J18, I1, I12, D31

1. Introduction

Dramatic changes in economic, social and cultural life of countries of Central and Eastern Europe (CEE) and Former Soviet Union (FSU) induced by the reforms of the end of the 80-ies and the 90-ies could not have left untouched the well-being of families and individuals. One of the potential dimensions of the influence is the effect on health, morbidity and mortality. Indeed, many countries of the group demonstrated sizable increases in mortality and declines in life expectancy at the initial years of the reform. For instance, male life expectancy decreased cumulatively by 1.57 years in 1989-1994 in Hungary and by 0.97 years in 1989-1991 in Poland (European health for all database, 2008). The decline in life expectancy in the Czech Republic, however, was almost negligible and was quickly followed by a steady growth. At the same time, the FSU countries experienced much more pronounced, especially for males, increases in mortality rates and declines in life expectancy, with Russia being the leader. Moreover, many of the countries of the FSU are still not back to the upward trend in life expectancy and experienced another episode of sizeable decline after 1998. Male life expectancy from birth decreased cumulatively by 5.82 years in 1992-94 and again by 2.71 years in 1999-2003 in Russia (Figure A1 in Appendix). Female life expectancy in Russia experienced a decline by 2.6 years in 1992-94 and by 1.38 years in 1999-2003. As a result, male life expectancy in Russia is one of the lowest in Europe, and working age male mortality rate is among the highest.

The underlying factors behind the rise in mortality, and the role of the dramatic economic transformations in particular, are still in the center of public and academic discussions (c.f. Ellman, 1994, Andreev et.al., 1994, Chen et. al., 1996, Cutler, Deaton and Lleras-Muney, 2006). Several explanations of the mortality crisis are considered: malnutrition and unhealthy diet due to income decline and rise in poverty (Zohoori et.al., 1998); alcohol consumption/binge drinking (Leon et.al., 1997, Shkolnikov et.al., 1998, Brainerd and Cutler, 2005), with a special role of policy of low prices on vodka (Treisman, 2008); adverse expectations and exposure to stress caused by shock therapy policies (Leon and Shkolnikov, 1999, Brainerd and Cutler, 2005), including privatization (Stuckler et.al., 2009); deterioration of health care provision (Brainerd and Cutler, 2005); deterioration of social capital (Kennedy et.al., 1998). The majority of the papers focus on Russia as the sharpest case, with some interesting examples of studies on other countries (Eberstadt, 1990, 1994 on Eastern Europe, Riphahn and Zimmermann, 1998 on Eastern Germany; Brainerd and Cutler, 2005 on FSU countries).

A common approach is to utilize aggregate death certificate data to identify national and regional all-causes and cause-specific death rates. The aggregate mortality data is then used to test for the determinants of mortality patterns either on cross-section of countries (Brainerd and

Cutler, 2005, Stuckler et.al., 2009), or on a sample of regions in a country (Walberg et.al., 1998, Treisman, 2008). The use of individual data is very limited with the examples in Brainerd and Cutler (2005) on Russia and in Riphahn and Zimmermann (1998) on Eastern Germany. While producing important insights into mortality determinants, aggregate data do not allow controlling for household and individual heterogeneity thus limiting the strength of the tests. The paper is to contribute to the discussion by testing for the importance of various factors on mortality in Russia in 1994-2007 when controlling on the observable individual and household heterogeneity. The study is based on the Russian Longitudinal Monitoring survey (RLMS) - a nationally representative survey of more than 4,000 households run from 1992 with very rich individual questionnaire and careful monitoring of household circumstances.

There are several novel results of the study. First, we find empirical support to the longevity reducing role of relative deprivation and inequality measured on a non-income scale of a self-perceived position on the respect ladder. A potential role of inequality in non-income terms in shaping mortality and the lack of direct tests of this role is stressed in Deaton (2003). A room for this factor is even higher in transition countries with the drastic changes in relative status of large groups of people. Our study is the first direct test of this kind. We find that a lower self-assessed status measured as respect from others increases mortality hazard.

In line with the individual level literature (c.f. Deaton, 2003), we find no influence of relative position measured along monetary income scale on the risk of mortality when controlling for the absolute income position. In addition, poverty spells are likely to be hazardous to individual health, with the first poverty spell having the strongest influence which is in line to the findings by Oh (2001) and Zick and Smith (2001) for the US.

Second, career-related factors, and the degree of flexibility in the labor market measured as the observed frequent transitions between wage for wages and self-employment and entrepreneurship, or downward occupational mobility, reveals being an important factor of moderation of mortality risk. This adds micro-level evidence to the finding of Walberg et.al. (1998) who report that high rates of labor turnover in regions are associated with higher mortality rates: those who manage to adjust to the fast changes by accepting jobs in a different sector and/or of a different qualification level have better chances to survive. An open question here is what are the intrinsic characteristics of people that facilitate their adjustment in the labor market?

Third, the health detrimental role of smoking is confirmed, with the influence being comparable to the alcohol consumption. This is in some contrast to the results of aggregate studies on mortality that tend to downplay the role of smoking as compared to alcohol

consumption though the increase in tobacco consumption in transition is well documented (e.g., Perlman et.al., 2007).

Finally, the role of price of alcohol (vodka) in relative and absolute terms shows insignificant in mortality determination, with a tendency, if any, for higher mortality when prices are high. The likely mechanism behind the (weak) positive correlation is a hazardous substitution towards cheaper and more toxic liquids documented by Andrienko and Nemtsov (2005). This is in contrast to the regional-level result in Treisman (2008) who finds negative association between regional crude death rates and regional vodka prices for 1993-2005 and interprets this as a cost of the political populism and fearing of political opposition which put limits to vodka prices and caused the increased consumption of hard liquors.

The paper is organized as follows. Section 2 describes the data and construction of variables. Section 3 discusses the methodology applied. Section 4 discusses the results of the study and considers robustness checks. Section 5 concludes.

2. Data and construction of variables

The empirical basis of the study is the Russian Longitudinal Monitoring survey (http://www.cpc.unc.edu/rlms), rounds 5-16 covering the period from 1994 to 2007. The data are nationally representative and are based on the survey of more than 4,000 households per year which amounts to more than 10,000 adults per year. The sample is a two-stage random draw of dwellings from the population of the micro census of 1989. The dwellings are surveyed each year, with some additional dwellings added in the later periods of the survey to meet the national representation criteria. The dwelling-based longitudinal nature of the survey has some advantages and some drawbacks as compared to the true panel with respect to our task. On the one hand, the data are nationally representative in each year thus promising mortality rates closer to the population rates when adjusted for the size of the sample. On the other hand, there is a potential attrition bias due to the fact that some households leave the sample as they move out of the dwelling. The attrition issue is discussed in more detail below.

2.1 Dependent variable

The death event is registered in the sample on the basis of the information provided by the household head when the unit is surveyed at least two rounds in a row. A household head is asked to report whether any household member is missing during this survey round and the reason for that member being not in the household. One of the reasons reported is the death of the household member. Starting from 2001 the cause of the death is also reported. Along the period of thirteen years 1,245 adult persons (5% of the adults in the sample throughout the

period) in RLMS sample died, with 546 deaths in the 18-65 age groups (3% of the adults of the age group).

The unbalanced panel of adults covering 1994-2007 we have amounts to 24,440 individuals. During the period of thirteen years almost 80% of initial households left the sample as they moved out of the surveyed dwellings. It could be that those who left the sample have higher than sample average risk of dying. There are some ways to check whether it is true or not. The comparison of the demographic structure of the households that left the sample and those that stayed in the sample shows no significant difference between the two groups. Additionally, the Institute of Sociology which oversees the RLMS employs techniques to check on the mortality among some of the categories that left through attrition. In particular, there are potentially high chances that deaths of household members in one-person and two-person households (especially if headed by senior people) are not registered in the survey data. To check for this, administrative records are utilized. As a result, the attrition from the sample due to the death of one or both household members is reported to be about 1-2% of the households that leave the sample each year, with those who move to their relatives upon the death of their partners and thus disappear from the sample comprising another 1-2%. Hence, the attrition bias from this source is rather limited.

A potential indication of probable attrition bias is the fact that the average crude death rate based on RLMS is almost twice lower than the population death rate: about 9 per 1000 in comparison to 16 per 1000 as reported by the Russian statistical office (Rosstat). The working age crude death rate in RLMS sample is almost three times lower than the population rate, while the gender differences are comparable: the crude death rate for working age males is about 4 per 1000 in RLMS and 13 per 1000 in the population; the same figures for working age females are 1 per 1000 in RLMS and 3 per 1000 in the population. More detailed age distribution of the death cases by gender is presented in Figure 1. At the same time, there are other than attrition important sources of the underestimation of the death rates in the sample, with the major being the under representation of many risk groups including non-civil groups of the population.

Figure 1

The time variation of the death cases based on RLMS reflect some increase in the death rates after 2001 though not that pronounced as in the population data (Table A1 in Appendix). Analysis of causes of death available since 2001 show that the sample recorded causes resemble (roughly) the population pattern. Overall, RLMS is reasonably good in measuring adult mortality while the richness of the individual-level information on various aspects of economic and social

life together with the carefully measured household data makes it very attractive to study determinants of mortality.

2.1 Explanatory variables

Scholars from different fields confirm that psycho-social stress is one of the important factors behind deterioration of health and rise in mortality (e.g., Brunner, 1997, Riphahn and Zimmermann, 1998). As defined in 'economic terms' by Shapiro (1995) stress is a condition in which the individual perceives a discrepancy between the demands of the environment and the available resources. The data allows measuring the exposure of individuals to stress along several dimensions.

The first dimension is related to the increased uncertainty about affordable consumption level during the transition period: respondents are asked how concerned they are about getting the necessities (the details on the definitions of the variables used in the analysis are reported in Table A2 in Appendix). The average for the period share of adults who are very concerned about being unable to provide themselves with the bare essentials in the next 12 months is 44% concealing the decline from 49.7% in 1994 to 36% in 2006 (Table 1). While declining, the share is very high reflecting the lack of reliable insurance mechanisms against risks of loss of income generating capabilities in the society.

Table 1

Another potential source of stress is an individual's perceived rank in the society. As noted by Cutler et.al.(2006) individuals with low status and in subordinate position are subject to arbitrary demands by other and are thus exposed to stress and high risk of cardiovascular disease. At the same time, the expected adverse effect of relative deprivation and low status on health and longevity is not supported by micro data when the deprivation and status are measured by relative income (Deaton, 2003, Gerdtham and Johannesson, 2004). The dataset we use is unique in many respects, including the richness of indicators of self-perceived status. The battery of questions asked in each round include self-identification of relative position on the 9-step ladder of income, power and respect (the formulation of the questions are in Table A2 in Appendix). Two of the three measures add an important *non-income dimension* of the relative status thus enriching the discussion.

People are heterogeneous in many respects, including their reactions to similar shocks and perceived risks. The first decades of transition are characterized by sizeable changes in the labor market, including sectoral and occupational shifts (Sabirianova, 2002). Large groups of

people got exposed to the reallocation shocks. Some moved, and, say, left an engineering position for a position of a salesman in a furniture store; others opted to stay at the low-paid engineering position to avoid the downward shift along an occupational ladder. Which strategy is more health detrimental? The empirical evidence is very scarce (e.g., Lazareva, 2008). The detailed record of labor market history of individuals in our sample allows testing whether those rather mobile in terms of changing sectors of employment and occupations benefit in terms of higher longevity. We define those who experienced downward occupational mobility when employed for wages *or* several movements between work for wages and self-employment or entrepreneurship as being 'mobile in the labor market'. There are 5% of mobile adults in our total sample which amounts to 12% in the sample of working-age adults below 60 (Table 1).

There are social mechanisms to mitigate exposure to stress, formal and informal. When formal institutes of social cohesion are underdeveloped, as in Russia, people rely on informal sources of support, friends and family, to deal with their day to day problems (Kennedy et.al. 1998, Walberg et.al., 1998). Those lacking such sources of support are especially vulnerable to economic hardships following transformation. There are several indicators of this dimension of social capital available in the dataset: family related indicators (the size of the family, the presence of children in family) and the settlement type (urban versus rural). The indicators are rather broad and reflect other than social capital motives as well. The presence of children is likely to discourage risk-taking behavior of parents (Umberson, 1987, Kotler and Winghard, 1989) thus adding to the social function. Larger families may induce higher concern about getting necessities. Rural areas are likely to differ from urban areas in many respects, including the life style and drinking and smoking patterns. Still, the social capital dimension of the indicators is relevant as well. The mean demographic characteristics of the sample reported in Table 1 confirm that the demographic structure of the sample is close to the one reported by Rosstat on the Russian population.

Alcohol consumption considered by some persons as a stress-relieving strategy is viewed as one of the key factors behind the abnormal (for the level of economic development) mortality rates of the working age male population in Russia. The role of the factor is confirmed by the analysis of cause-specific death rates during the period and is hardly challenged by anybody (e.g., Leon et.al., 1997, Shkolnikov et.al., 1998, Gavrilova et.al., 2000). We test for the role of the factor by distinguishing between binge drinkers defined as those who drink alcohol every day or 4-6 times a week and the rest of the population. An alternative measure of binge drinking based on the amount of alcohol consumed per day is believed to be a weaker measure since respondents tend to misreport the alcohol intake (Andienko and Nemtsov, 2006). Additionally, the question on the amount of alcohol intake changed in 2006 thus limiting its comparability

across periods. There are 3% of binge drinkers in our total sample, with 5.5% among working age males and 1% among working age females.

We also test for the adverse effect of low alcohol prices documented in aggregate regional-level data (Treisman, 2008) by controlling for the relative (to bread) and absolute price of vodka (deflated to 1994 level) in a locality[1]. The variation in relative prices across localities is sizeable: the mean across localities (lowest) price of one liter of vodka is about 7 times the price of one kilogram of wheat bread, with the standard deviation of 3.6.

In addition to the role of the abuse of alcohol consumption we test for the influence of smoking on longevity by controlling for the smoking habit. The well documented health detrimental effect of smoking in general is somewhat downplayed in the Russian context despite the unfavorable change in the pattern of smoking recorded with the increased youth and female smoking rates (e.g., Arzhenovsky, 2006, Perlman et.al., 2007). More than 30% of adults in the sample smoke, with the rate amounting to 60% for males. Note that we always control for the education level (measured by the highest education degree achieved) as an important factor of individual behavior including the choice of healthier lifestyles (Shkolnikov et.al., 1998).

The next group of variables is to capture the economic well-being of households individuals live in. Absolute income is a well documented determinant of health and longevity, and is proxied by household consumption. In addition to income, poverty has a potential of increasing mortality risk via less healthy diet, limiting access to private medical care and to other important consumption items (Duleep, 1986, Moore and Hayward, 1990, Zick and Smith, 1991). The limitations are likely to expose family members to stress. Experience of long-term poverty may be even more health detrimental though Oh (2001) shows that the first poverty spell is especially potent in explaining the mortality risk, with the rest spells being less influential. We allow the first and the next poverty spells induce differentiated influence on mortality risk.

Finally, we test for the influence of the deterioration in access to the qualified medical care on the longevity by focusing on the medicine availability and affordability. Medicine expenses are by and large privately financed in Russia with subsidization of the most vulnerable groups. On average, five per cent of adults report having no money or failing to find the prescribed medicine, with the share being higher at the initial years of transition and in 1998.

We control for individual health stock by both self-assessed health indicator and selected objective measures of health including the body mass index and its square and the incidence of heart attack, stroke and diabetes.

[1] A locality is defined at the level of a community (site variable) in RLMS. There are about 150 communities in RLMS. The information on the infrastructure of the population center and the prices of basic food products is collected by interviewers in each locality each year. The community questionnaire is available at http://www.cpc.unc.edu/rlms.

3. Empirical Methodology

The core methodology of our study is survival (duration) analysis. The approach allows exploiting the features of longitudinal data and permits overcoming the estimation bias coming from the problem of non-normality of the distribution for time to an event and of right-censoring (c.f. Kiefer, 1988 for a survey). The approach is widely used for studies of mortality based on micro data[2]. The central idea of the approach is to estimate the hazard rate defined as the probability that the spell ends at time *t* conditional that the spell lasts till period t for the observations with completed spells and to estimate survival function for the observations with uncompleted or right-censored spells. In mortality studies the hazard rate at age t is the conditional probability of dying at age t having survived to that age, and the survival rate at age t is the probability of surviving till age t.

We use proportional hazard specification in which the hazard function is a product of a baseline hazard and a term that shifts the baseline hazard proportionally in accord with the influence of various covariates. The baseline hazard is a function of age.

$$\lambda(t, x, \beta, \lambda_0) = \phi(x, \beta)\lambda_0(t),$$

where λ_0 - base hazard function, corresponding to $\phi(\cdot) = 1$, $\phi(x, \beta) = \exp(x'\beta)$, x - vector of explanatory variables, β - estimated coefficients. Two types of the baseline function specifications are used. The first one is a parametric specification which assumes that the baseline hazard is from the Gompertz class of distributions with an estimated gamma parameter. The second specification is a flexible Cox proportional hazard model in which the base hazard function is left unspecified. Robust Huber-White estimator of variance is applied to calculate standard errors.

Given the modest number of death cases, we do not subdivide the sample into the sub-samples of males and females but rather control for gender in the vector of explanatory variables and allow for the gender specific baseline function in some specifications, both parametric and non-parametric. In each case we also control for individual health stock by both self-assessed health indicator and selected objective measures of health including the body mass index and its square and the incidence of heart attack, stroke and diabetes.

The vector of explanatory variables x includes several groups of factors reflecting competing theories discussed above: self-perceived social status; labor market related indicators of stress and flexibility; health care accessibility; health detrimental habits and alcohol

[2] For instance, Smith and Zick (1994) study mortality of husbands and wives using the Panel Study of Income Dynamics. Gerdtham and Johannesson (2004) use Cox model to test for the role of absolute and relative income in mortality using Swedish micro data.

availability; household economic well-being; individual human capital and social capital indicators.

Kaplan-Meier estimates of survival functions being a convenient way of presenting the dependent variable of our study provide support to both the choice of the Gompertz-class of the parametric functions as the baseline hazard/survival (compare the two survival functions, empirical and analytical, in the upper panel of Figure 2) and the choice of the explanatory variables (the other panels in Figure 2).

Figure 2

4. Results

The results of the estimates of proportional mortality hazard models on the sample of working age (18-65) adults are reported in Table 2. Specifications 1 to 4 assume parametric baseline hazards, with 3 and 4 letting the differentiation of the baseline hazard by gender. Specifications 5 to 8 are Cox proportional hazard models, with 7 and 8 allowing for the baseline hazard stratification on gender. Another difference between the specifications is the inclusion of relative or absolute price of alcohol. Hazard ratios rather than coefficients are reported with robust standard errors in brackets.

Let us start with the stress-related factors. The first group of the results highlights the role of absolute and relative (income and non-income) position of a person in mortality. Controlling for other factors, higher household income increases longevity, while poverty experience decreases longevity. The first poverty spell is the most detrimental and increases mortality hazard by almost 50 percentage points, with the next poverty episodes being statistically insignificant.

Self-accessed relative position when measured along an income scale is statistically insignificant with a tendency of a higher rank to lower mortality hazard rates. In contrast, respect rank is significant in shaping mortality hazards. Those with higher self-assessed status measured along the respect scale have lower mortality hazard: movement to a higher ladder step decreases mortality hazard by 5.3 percentage points. Hence, we confirm the insignificance of income measured relative deprivation and find empirical support to the role of non-income measured relative deprivation.

An alternative measure of stress measured as the perceived high risk of being unable to provide the bare essentials shows insignificant with a tendency to increase the mortality hazard.

Those who experienced frequent changes in the labor market including downward occupational shifts show almost 50 percentage point lower mortality hazard rates. We interpret this in favor of higher psychological flexibility of this group of respondents: those who moved are likely to be more flexible not only in labor market terms but possibly in psychological terms as well thus revealing better adjustment ability.

Health detrimental lifestyles, smoking and alcohol consumption do increase mortality hazard rates. Importantly, smoking raises the mortality hazard as strong as binge drinking. Those who smoke have 64 percentage points higher mortality hazard as compared to those who do not smoke, and binge drinkers have 56 percentage point higher hazard rates. The result points to the importance of anti-smoking measures as an integral part of health promoting policy.

Neither absolute nor relative price of alcohol (vodka) affect the hazard rates in our data. If anything, we find a weak positive association between alcohol prices and mortality hazard which could be attributed to the adverse effect of substitution for cheaper and toxic liquids.

The evidence with respect to the social capital measures we use is mixed. The presence of children in family increases longevity by reducing hazard rate by 20 percentage points. At the same time, living in an extended (larger) family increases mortality hazard by 15 percentage points. The latter could reflect higher concern for getting necessities in larger families. Marital status shows to be insignificant.

We find that living in urban area decreases mortality hazard by 23 percentage points. The sign of the effect is in line with the aggregate data. We also confirm that better education is beneficial for longevity: holders of university degree have almost 40 percentage point lower mortality hazard rate.

Finally, a poor access to healthcare measured as inability to afford or find the prescribed medicine show insignificant in shaping mortality hazard with a tendency to increase it.

Table 2

Table 3 presents results of the estimates of proportional mortality hazard models on total sample of adults. The major results are the same with the most important difference being the detrimental role of not only the first but also the next poverty spells. We should also notice the unusual positive association of marriage and mortality hazard in our sample. The result is likely to reflect the abnormally high gap between male and female life expectancy in Russia: majority of pension-age females are widows in Russia which is in contrast to the developed countries.

Table 3

The results show to be robust across different specifications. The signs and the significance levels are robust with respect to the parametric versus nonparametric baseline hazard specification and survive allowing for gender stratification. It is only in some cases that the magnitude of the coefficients changes slightly. Additional robustness checks came from inclusion of the variables of interest by portions and by omission of the variables that could potentially bias the results. For instance, we dropped the settlement type dummy and the binge drinker variable when testing for the robustness of the price of alcohol result. The results did not change.

5. Conclusions

Mortality crisis in countries of the Former Soviet Union and Russia in particular attracts attention of academic and policy community. The majority of the studies are based on aggregate data limiting the scope of the discussion to the measures available at national and sub national level. The paper is one of the first to study determinants of Russian adult mortality controlling for individual and household heterogeneity. The results are original in several respects.

First, we find empirical support to the importance of relative status measured in non-income terms in shaping mortality hazards. Income-measured relative position is confirmed to be statistically insignificant which is in line with the micro evidence from other countries.

Second, we find evidence on the influence of labor market behavior, and sectoral and occupational mobility in particular, on longevity. We attribute the effect to the association of higher mobility in the labor market and higher psychological flexibility. The effect could be particularly noticeable during periods of sizeable structural changes like transition from plan to market or adjustment to deep global crisis.

Third, the health detrimental role of smoking is found to be comparable to the role of excess alcohol consumption. The result is novel in the Russian context where the influence of smoking is downplayed in comparison to the alcoholism.

Finally, we find no micro evidence in support to the regional data result underlying Treisman (2008) political economy story. If anything, there is a (very weak) positive association between prices of hard alcohol and mortality hazard.

Statistical significance of the effects operating via relative non-income status and labor market transitions which survives control for more traditional hazards of unhealthy lifestyles is a confirmation of the adverse effects of economic transformations on adult longevity. Mechanisms, formal and informal, to facilitate individual adjustment to the changed economic and social environment are to be a part of mortality reducing policies.

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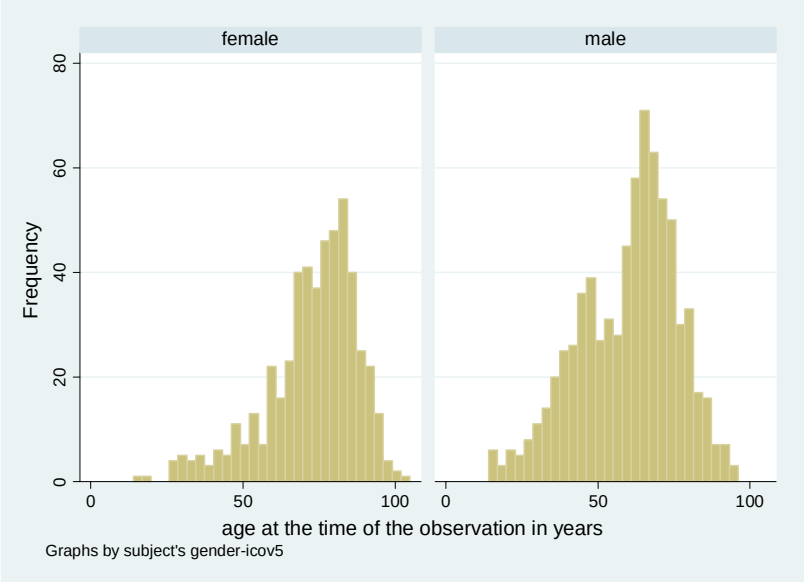
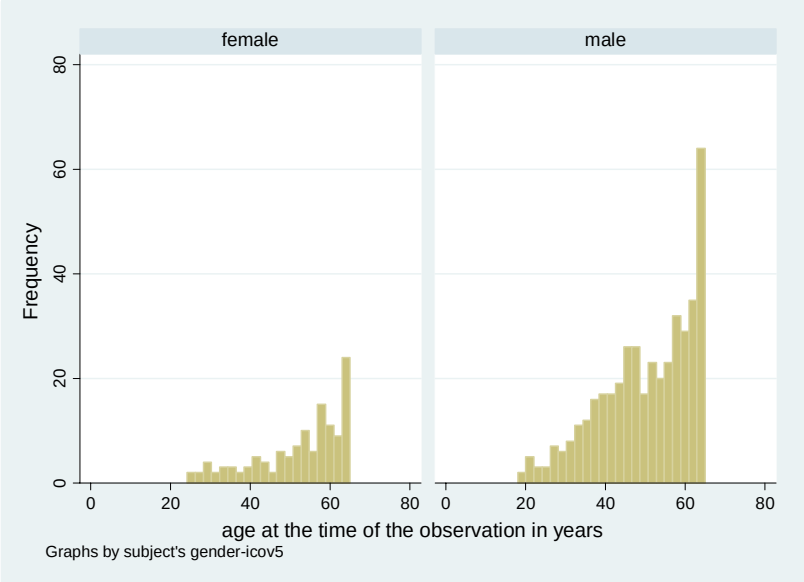
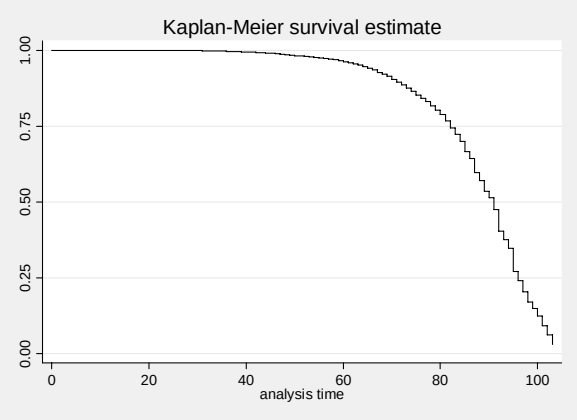


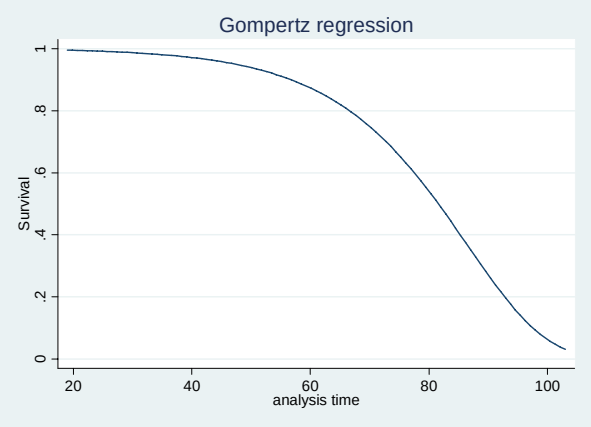
Panel A

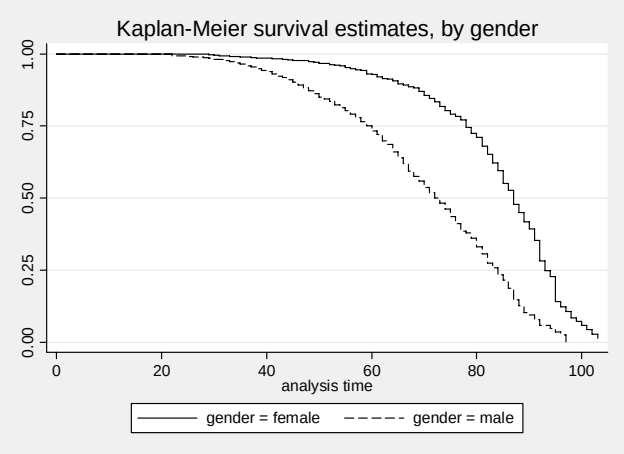


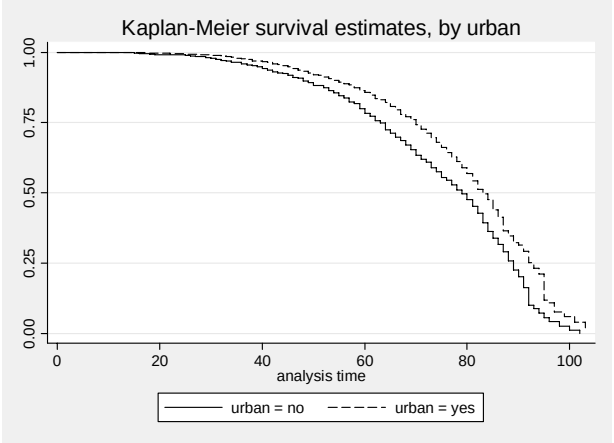
Panel B

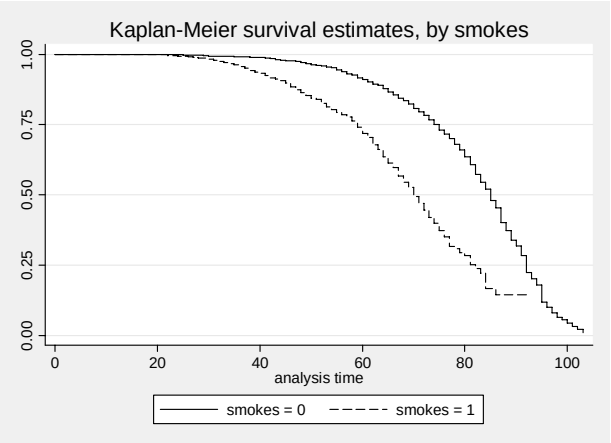
Figure 1. Age distribution of death cases in RLMS, 1994-2007, males and females, total sample (Panel A) and sample of working age, 18-65 years, (Panel B)

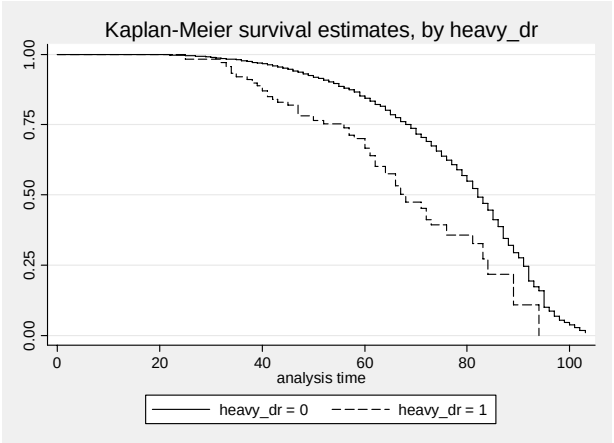


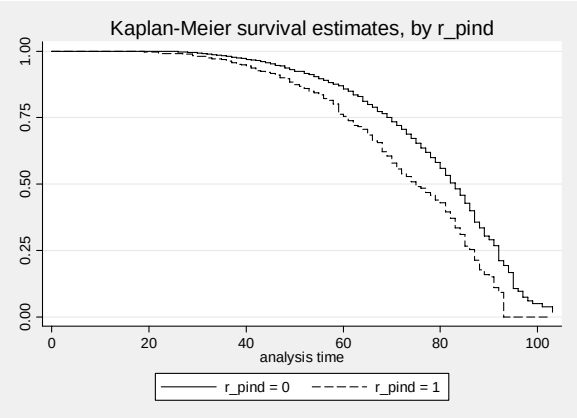












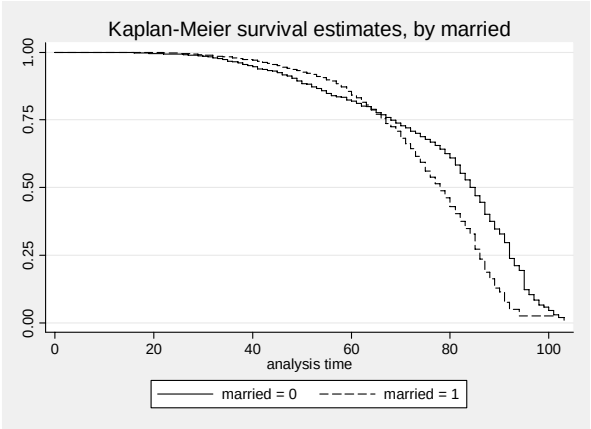


Figure 2. Kaplan-Meier survival functions, various subgroups
Note: r_pind is the poverty indicator

Table 1. Summary statistics of explanatory variables

	Mean	Standard deviation
Age (upon entry to the sample)	38.37	18.88
Gender (1-male, 0-female)	0.45	0.50
Married	0.27	0.44
Family size	3.43	1.54
Presence of childen in household	0.55	0.50
Junior or secondary professional education	0.45	0.50
University degree	0.16	0.37
Smokes	0.33	0.47
Binge drinker	0.03	0.16
Body mass index	24.80	5.10
Ever had a heart attack	0.02	0.15
Ever had a stroke	0.01	0.11
Diabetic	0.03	0.18
Self-assessed health (1-very bad, …, 5-very good)	3.21	0.76
Could not afford or find prescribed medicine	0.05	0.22
Concern about getting necessities	0.44	0.50
Experienced more than three movements in labor market or downward occupational mobility	0.05	0.21
Live in urban settlement	0.73	0.45
Consumption decile	5.68	2.89
Economic rank (1-the poorest, …, 9- the richest)	3.66	1.52
Respect rank (1-the least respected, …, 9- the most respected)	5.84	1.85
Household in poverty	0.20	0.40
Relative price of vodka to bread in locality	7.15	3.64
Log vodka price in locality (in 1994 prices)	11.59	2.46

Table 2. Determinants of mortality, working age population, 18-65

	Parametric Gompertz regression				Non-parametric Cox regression			
			Stratified on gender				Stratified on gender	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Gender: male=1	3.49	3.505	3.493	3.476	3.542	3.529		
	[0.517]***	[0.518]***	[1.761]**	[1.752]**	[0.520]***	[0.519]***		
Economic well-being								
Household in poverty: the 1st poverty episode	1.486	1.483	1.486	1.483	1.468	1.472	1.478	1.484
	[0.241]**	[0.242]**	[0.241]**	[0.242]**	[0.238]**	[0.237]**	[0.240]**	[0.239]**
Household in poverty: the 2nd, 3d, ... poverty episodes	1.056	1.062	1.056	1.062	1.031	1.026	1.032	1.028
	[0.147]	[0.151]	[0.148]	[0.151]	[0.148]	[0.145]	[0.148]	[0.145]
Consumption decile (within year)	0.935	0.935	0.935	0.935	0.934	0.934	0.934	0.935
	[0.018]***	[0.018]***	[0.018]***	[0.018]***	[0.018]***	[0.018]***	[0.018]***	[0.018]***
Self-perceived status								
Economic rank on 9-step ladder	0.981	0.982	0.981	0.982	0.981	0.981	0.984	0.983
	[0.038]	[0.038]	[0.038]	[0.038]	[0.037]	[0.038]	[0.038]	[0.038]
Respect rank on 9-step ladder	0.947	0.947	0.947	0.947	0.949	0.95	0.948	0.948
	[0.026]**	[0.026]**	[0.026]**	[0.026]**	[0.026]*	[0.026]*	[0.026]*	[0.026]*
Stress indicator								
Concern about getting necessities	1.091	1.093	1.091	1.093	1.067	1.066	1.067	1.067
	[0.115]	[0.115]	[0.115]	[0.115]	[0.112]	[0.112]	[0.112]	[0.112]
Mobile in labor market	0.509	0.508	0.509	0.508	0.479	0.479	0.475	0.475
	[0.109]***	[0.109]***	[0.109]***	[0.109]***	[0.103]***	[0.103]***	[0.102]***	[0.103]***
Habits								
Smokes	1.635	1.633	1.636	1.632	1.574	1.576	1.577	1.578
	[0.204]***	[0.205]***	[0.204]***	[0.204]***	[0.196]***	[0.195]***	[0.196]***	[0.195]***
Binge drinker	1.562	1.563	1.563	1.563	1.533	1.533	1.535	1.534
	[0.282]**	[0.282]**	[0.282]**	[0.282]**	[0.275]**	[0.275]**	[0.276]**	[0.275]**
Alchohol availability								
Log of the lowest vodka price in locality		1.008		1.008	1.006		1.004	
		[0.027]		[0.027]	[0.027]		[0.027]	
Relaive price of vodka to bread in locality	1.012		1.012			1.012		1.011
	[0.014]		[0.014]			[0.014]		[0.014]
Health care accessibility								
Could not afford or find prescribed medicine	1.203	1.203	1.203	1.203	1.216	1.216	1.233	1.234
	[0.236]	[0.235]	[0.236]	[0.236]	[0.238]	[0.239]	[0.241]	[0.242]

Table 2 continued

	Parametric Gompertz regression				Non-parametric Cox regression			
			Stratified on gender				Stratified on gender	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Social and individual human capital								
Married	1.052	1.044	1.052	1.044	1.021	1.028	1.026	1.031
	[0.115]	[0.118]	[0.116]	[0.119]	[0.117]	[0.114]	[0.119]	[0.116]
Family size, number of people in family	1.148	1.147	1.148	1.147	1.158	1.159	1.16	1.16
	[0.039]***	[0.039]***	[0.039]***	[0.039]***	[0.039]***	[0.039]***	[0.040]***	[0.040]***
Children in family	0.792	0.794	0.792	0.794	0.727	0.725	0.721	0.719
	[0.110]*	[0.110]*	[0.110]*	[0.110]*	[0.104]**	[0.104]**	[0.103]**	[0.103]**
Education: secondary school and below - reference category								
Junior or secondary professional	0.826	0.828	0.826	0.828	0.787	0.785	0.788	0.785
	[0.090]*	[0.091]*	[0.091]*	[0.092]*	[0.087]**	[0.087]**	[0.088]**	[0.087]**
University degree or higher	0.625	0.624	0.625	0.624	0.588	0.588	0.588	0.588
	[0.116]**	[0.116]**	[0.116]**	[0.116]**	[0.110]***	[0.109]***	[0.110]***	[0.110]***
Urban settlement	0.768	0.756	0.768	0.756	0.745	0.757	0.747	0.758
	[0.079]**	[0.077]***	[0.079]**	[0.077]***	[0.075]***	[0.078]***	[0.075]***	[0.078]***
Health indicators								
Health self-evaluation (1-very bad, …, 5-very good)	0.533	0.532	0.533	0.532	0.523	0.524	0.521	0.521
	[0.045]***	[0.045]***	[0.045]***	[0.045]***	[0.044]***	[0.044]***	[0.044]***	[0.044]***
Body mass index	0.965	0.966	0.965	0.966	0.965	0.964	0.963	0.962
	[0.017]**	[0.017]**	[0.017]**	[0.017]**	[0.017]**	[0.017]**	[0.017]**	[0.017]**
Body mass index squared	1	1	1	1	1	1	1	1
	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***
Ever had a heart attack	1.568	1.559	1.568	1.559	1.61	1.618	1.609	1.616
	[0.284]**	[0.282]**	[0.284]**	[0.282]**	[0.293]***	[0.295]***	[0.294]***	[0.296]***
Ever had a stroke	1.713	1.707	1.713	1.707	1.74	1.748	1.719	1.724
	[0.397]**	[0.396]**	[0.397]**	[0.396]**	[0.412]**	[0.414]**	[0.412]**	[0.414]**
Diabetic	1.833	1.827	1.833	1.827	1.859	1.865	1.862	1.867
	[0.359]***	[0.358]***	[0.358]***	[0.358]***	[0.364]***	[0.364]***	[0.365]***	[0.365]***
Gompertz function coefficents								
Gamma coefficient	0.055	0.055	0.055	0.055				
	[0.005]***	[0.005]***	[0.009]***	[0.009]***				
Gamma*female			-0.0001	0.0001				
			[0.009]	[0.009]				
Observations	71425	71425	71425	71425	71425	71425	71425	71425
No. of subjects	17683	17683	17683	17683	17683	17683	17683	17683
No. of failures	426	426	426	426	426	426	426	426
Log Pseudolikelihood	-618.22	-618.66	-618.22	-618.66	-2891.52	-2891.11	-2661.06	-2660.69

Robust standard errors in brackets; * significant at 10%; ** significant at 5%; *** significant at 1%

Table 3. Determinants of mortality, total adult sample

	Parametric Gompertz regression				Non-parametric Cox regression			
			Stratified on gender				Stratified on gender	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Gender: male=1	2.465	2.474	6.722	6.709	2.576	2.56		
	[0.217]***	[0.219]***	[2.397]***	[2.394]***	[0.228]***	[0.225]***		
Economic well-being								
Household in poverty: the 1st poverty episode	1.563	1.571	1.552	1.557	1.561	1.545	1.564	1.552
	[0.177]***	[0.181]***	[0.176]***	[0.180]***	[0.179]***	[0.174]***	[0.181]***	[0.176]***
Household in poverty: the 2nd, 3d, ... poverty episodes	1.264	1.27	1.253	1.257	1.233	1.224	1.22	1.213
	[0.132]**	[0.134]**	[0.130]**	[0.133]**	[0.132]*	[0.129]*	[0.130]*	[0.128]*
Consumption decile (within year)	0.963	0.963	0.963	0.963	0.96	0.96	0.96	0.959
	[0.012]***	[0.012]***	[0.012]***	[0.012]***	[0.012]***	[0.012]***	[0.012]***	[0.012]***
Self-perceived status								
Economic rank on 9-step ladder	0.994	0.994	0.994	0.994	0.99	0.991	0.993	0.993
	[0.026]	[0.026]	[0.026]	[0.026]	[0.026]	[0.026]	[0.026]	[0.026]
Respect rank on 9-step ladder	0.94	0.94	0.942	0.942	0.946	0.946	0.945	0.945
	[0.017]***	[0.017]***	[0.017]***	[0.017]***	[0.017]***	[0.017]***	[0.017]***	[0.017]***
Stress indicator								
Concern about getting necessities	0.971	0.973	0.973	0.975	0.956	0.953	0.954	0.951
	[0.068]	[0.068]	[0.068]	[0.068]	[0.067]	[0.067]	[0.067]	[0.067]
Mobile in labor market	0.554	0.552	0.536	0.534	0.494	0.496	0.484	0.485
	[0.117]***	[0.116]***	[0.113]***	[0.112]***	[0.104]***	[0.105]***	[0.102]***	[0.103]***
Habits								
Smokes	1.752	1.749	1.698	1.697	1.664	1.671	1.623	1.627
	[0.154]***	[0.154]***	[0.153]***	[0.153]***	[0.148]***	[0.148]***	[0.150]***	[0.150]***
Binge drinker	1.312	1.311	1.318	1.317	1.293	1.295	1.281	1.282
	[0.202]*	[0.202]*	[0.202]*	[0.202]*	[0.197]*	[0.198]*	[0.195]	[0.196]
Alchohol availability								
Log of the lowest vodka price in locality		1.01		1.008	1.016		1.013	
		[0.019]		[0.019]	[0.019]		[0.020]	
Relaive price of vodka to bread in locality	1.007		1.007			1.008		1.007
	[0.009]		[0.009]			[0.009]		[0.009]
Health care accessibility								
Could not afford or find prescribed medicine	1.144	1.147	1.15	1.151	1.154	1.148	1.144	1.14
	[0.142]	[0.142]	[0.143]	[0.142]	[0.143]	[0.143]	[0.142]	[0.141]

Table 3 continued

	Parametric Gompertz regression				Non-parametric Cox regression			
			Stratified on gender				Stratified on gender	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Social and individual human capital								
Married	1.206	1.199	1.263	1.257	1.198	1.211	1.25	1.26
	[0.093]**	[0.093]**	[0.101]***	[0.102]***	[0.097]**	[0.096]**	[0.105]***	[0.103]***
Family size, number of people in family	1.229	1.229	1.227	1.227	1.229	1.23	1.228	1.229
	[0.029]***	[0.029]***	[0.029]***	[0.029]***	[0.029]***	[0.029]***	[0.030]***	[0.030]***
Children in family	0.823	0.823	0.822	0.822	0.771	0.77	0.771	0.77
	[0.089]*	[0.089]*	[0.088]*	[0.088]*	[0.085]**	[0.085]**	[0.085]**	[0.085]**
Education: secondary school and below - reference category								
Junior or secondary professional	0.869	0.869	0.882	0.882	0.835	0.836	0.839	0.84
	[0.064]*	[0.064]*	[0.065]*	[0.066]*	[0.063]**	[0.063]**	[0.064]**	[0.064]**
University degree or higher	0.712	0.708	0.732	0.729	0.681	0.686	0.705	0.709
	[0.090]***	[0.090]***	[0.092]**	[0.092]**	[0.087]***	[0.087]***	[0.091]***	[0.091]***
Urban settlement	0.879	0.871	0.877	0.87	0.86	0.869	0.857	0.865
	[0.062]*	[0.061]**	[0.062]*	[0.061]**	[0.060]**	[0.061]**	[0.060]**	[0.061]**
Health indicators								
Health self-evaluation (1-very bad, …, 5-very good)	0.533	0.532	0.532	0.531	0.516	0.516	0.511	0.512
	[0.028]***	[0.028]***	[0.028]***	[0.028]***	[0.027]***	[0.027]***	[0.027]***	[0.027]***
Body mass index	0.972	0.972	0.972	0.972	0.973	0.973	0.973	0.973
	[0.008]***	[0.008]***	[0.008]***	[0.008]***	[0.009]***	[0.009]***	[0.009]***	[0.009]***
Body mass index squared	1	1	1	1	1	1	1	1
	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***
Ever had a heart attack	1.326	1.325	1.335	1.334	1.362	1.363	1.349	1.35
	[0.136]***	[0.136]***	[0.137]***	[0.137]***	[0.141]***	[0.141]***	[0.140]***	[0.140]***
Ever had a stroke	1.756	1.75	1.772	1.767	1.799	1.81	1.841	1.849
	[0.206]***	[0.206]***	[0.208]***	[0.208]***	[0.212]***	[0.213]***	[0.216]***	[0.216]***
Diabetic	1.433	1.429	1.425	1.422	1.485	1.49	1.472	1.476
	[0.164]***	[0.164]***	[0.163]***	[0.162]***	[0.170]***	[0.170]***	[0.167]***	[0.168]***
Gompertz function coefficents								
Gamma coefficient	0.06	0.06	0.07	0.07				
	[0.003]***	[0.003]***	[0.004]***	[0.005]***				
Gamma*female			-0.015	-0.015				
			[0.005]***	[0.005]***				
Observations	84922	84922	84922	84922	84922	84922	84922	84922
No. of subjects	19873	19873	19873	19873	19873	19873	19873	19873
No. of failures	910	910	910	910	910	910	910	910
Log Pseudolikelihood	-434.49	-436.60	-431.66	-431.92	-5751.55	-5751.37	-5200.33	-5200.15

Robust standard errors in brackets; * significant at 10%; ** significant at 5%; *** significant at 1%

APPENDIX

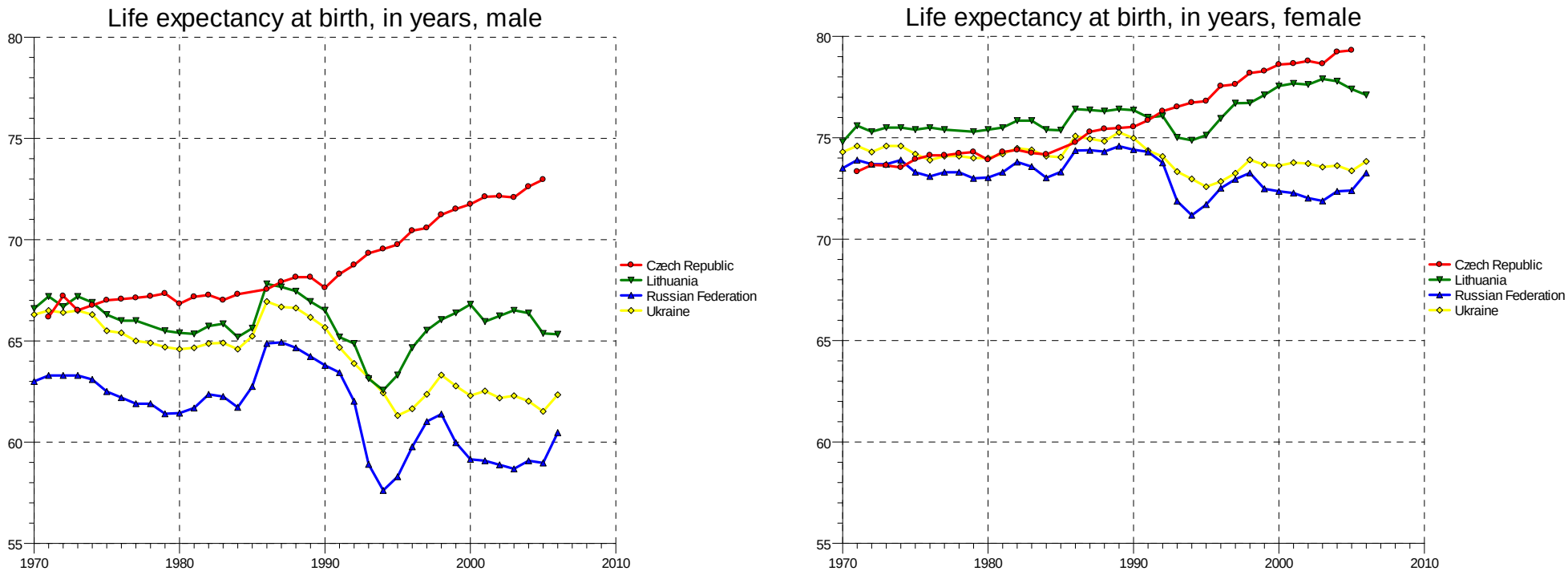


Figure A1. Life expectancy at birth, males and females, Russia and selected countries
Source: *European "Health for All" database, WHO, 2008*

Table A1. Reported death cases in RLMS, by year

Year of reported death	Frequency	Percent
1995	78	6.26
1996	105	8.43
1998	190	15.25
2000	171	13.72
2001	92	7.38
2002	112	8.99
2003	113	9.07
2004	102	8.19
2005	105	8.43
2006	82	6.58
2007	96	7.7
Total	1,245	100

Note: Notice that there were 2-year gaps between 1996 and 1998, and 1998 and 2000. Hence the reported death cases for the years are for two-year period and for a one-year period for the rest of the years.

Table A2. Description of variables

Death event	Death is reported to be the reason why [NAME AND PATRONYMIC] is no longer a member of a household
Married	In a registered marriage
Smokes	Smokes now
Binge drinker	Used alcoholic beverages every day or 4-6 times a week in the last 30 days
Body mass index	Weight/Height^2 based on height and weight reported in 'Medical measurement section'
Ever had a heart attack	Have you ever been diagnosed with a “myocardial infarction”?
Ever had a stroke	Has a doctor ever diagnosed you as having had a stroke--blood hemorrhage in the brain?
Diabetic	Did a physician tell you at any time that you had diabetes or increased sugar in the blood?
Self-estimated health	How would you evaluate your health? 1-very bad, …, 5-very good
Could not afford or find prescribed medicine	There were medicines prescribed or recommended in the last 30 days that you were not able to find or buy: had no money or could not find in pharmacy
Concern about getting necessities	How concerned are you about the possibility that you might not be able to provide yourself with the bare essentials in the next 12 months? Recoded from 1-5 scale into a binary scale: 1- very concerned and 0 otherwise
Experienced more than three movements in labor market or downward occupational mobility	Moved between work for wages, self-employment or entrepreneurship and non-employment and had more than three shifts OR experienced downward occupational mobility. The shifts are recorded on the basis of the job sections of adult questionnaire for each year
Consumption decile	Decile based on per capita household expenditure in a year
Economic rank (1-the poorest, …, 9- the richest)	Please imagine a nine-step ladder where on the bottom, the first step, stand the poorest people, and on the highest step, the ninth, stand the rich. On which step of the nine are you today?
Respect rank (1-the least respected, …, 9- the most respected)	And now another nine-step ladder where on the lowest step stand people who are absolutely not respected, and on the highest step stand those who are very respected. On which of the nine steps are you personally standing today?
Household in poverty	Household income is below absolute poverty rate. The poverty level is based on the minimum consumption basket and takes into account regional prices, demographic compostion of a household and economies of scales
Relative price of vodka to bread in locality	Relative price of the lowest price of vodka to the price of white bread in a primary sample unit
Log vodka price in locality (in 1994 prices)	Logarithm of the lowest price of vodka in a primary sample unit deflated to 1994 by annual CPI