I Z A Institute
of Labor Economics
Initiated by Deutsche Post Foundation

DISCUSSION PAPER SERIES

IZA DP No. 13540

Economic Crises and Mortality Among the Elderly: Evidence from Two Russian Crises

Margarita Khvan
Elizaveta Smorodenkova
Evgeny Yakovlev

JULY 2020

I Z A Institute
of Labor Economics

Initiated by Deutsche Post Foundation

DISCUSSION PAPER SERIES

IZA DP No. 13540

Economic Crises and Mortality Among the Elderly: Evidence from Two Russian Crises

Margarita Khvan
NES

Elizaveta Smorodenkova
NES

Evgeny Yakovlev
NES and IZA

JULY 2020

ISSN: 2365-9793

IZA – Institute of Labor Economics

Schaumburg-Lippe-Straße 5–9
53113 Bonn, Germany

Phone: +49-228-3894-0
Email: publications@iza.org

www.iza.org

ABSTRACT

Economic Crises and Mortality Among the Elderly: Evidence from Two Russian Crises*

We assess the short-term effects of the two recent economic crises, the Great Recession and the collapse of the USSR, on the elderly mortality in Russia. According to our study, crises have led to an increase in mortality with quantitatively similar elasticities of death with respect to GDP fall for both events. Further analysis of the Great Recession suggests that income depreciation, limited access to medical services, and an increase in alcohol consumption are responsible for the rise in mortality. While increases at a higher rate compared to overall mortality, alcohol-related mortality explains a relatively small part of total mortality rise.

JEL Classification: J1, H1, I1
Keywords: mortality, crises

Corresponding author:
Evgeny Yakovlev
NES
Skolkovskoe shosse 45
Skolkovo, Moscow 143026
Russia
E-mail: eyakovlev@nes.ru

* Margarita Khvan, Elizaveta Smorodenkova and Evgeny Yakovlev gratefully acknowledge financial support from the Russian Science Foundation for the research project No. 18-18-00466.

1 Introduction

COVID-19 pandemic and measures to combat it are resulting in a worldwide economic crisis. Apart from the direct negative health impact of the pandemic, how is the economic side of this crisis affecting population health? A large body of previous literature suggests that, while crises usually do not deteriorate health in developed countries, they often hit the developing world. In this long-standing discussion, Russia plays an important role. To the best of our knowledge, the most cited example that negative GDP shock may result in a sizable increase in mortality, is the mortality crisis in the 1990s resulted from the collapse of the USSR and a large-scale economic crisis that followed it (see Cutler et al. 2002, Ruhm, 2015b and others).

However, the collapse of the Soviet Union was a unique natural experiment. The crisis resulted in a twofold drop in GDP that is several times higher in scale than any other recent crisis and fifty percent higher than the US GDP fall during the Great Depression. Together with the economic depreciation, the crisis failed governing institutions that worked before in the socialistic environment, including social security system, medical care system, etc (see Jensen and Richter 2003, Brainerd and Cutler 2005).

Moreover, the literature suggests that this surge in mortality was driven to a large extent by the increase in alcohol-related mortality of among working age-population that jumped at the beginning of the 1990s, rather than by economic depreciation and limited access to medical services. The collapse of the Soviet Union ended the Gorbachev anti-alcohol campaign and started uncontrolled liberalization of the alcohol market. A resulted decrease in the price and increase in the availability of alcohol boosted alcohol consumption and alcohol-related mortality that jumped at the beginning of the 1990s. Moreover, the manifestation of postponed alcohol-related mortality after Gorbachev's anti-alcohol campaign amplified the effect of the liberalization of the alcohol market (see Brainerd and Cutler 2005; Brainerd 2001; Bhattacharya, Gathmann, and Miller 2013, Triesman 2010 in economic literature; and Leon, Chenet, Shkolnikov et al. 1997; Shkolnikov, McKee, and Leon 2001 in medical studies). The unique circumstances of this dramatic increase in mortality bound the external validity of the findings of this natural experiment to the general analysis of the mortality impact of economic shocks.

In our study, we re-examine this question with a focus on the elderly population using data on two crises: the crisis after the collapse of the Soviet Union and the Great Recession of 2008-2010. First, we show that excessive mortality and deterioration of health are consistently observed consistently in both crises. Moreover, we find quantitatively similar elasticity of mortality with respect to a GDP drop. According to our study, a 10% fall in GDP leads to a 3% increase in overall mortality. Focus on the Great Recession and on elderly population allows us to conclude that deterioration of the quality of social security and medical services, disruptions in healthcare during the crisis years, and, to a lesser extent, softening regulation of the alcohol market regulation are all responsible for the excessive mortality among the elderly. Unlike among the working-age population, alcohol-related mortality constitutes a small part of total deaths cases of among the elderly. Besides, the Great Recession occurred well considerably after the Gorbachev anti-alcohol campaign (and so there was no postponed mortality) and after Russia had implemented several strict regulations in the alcohol market that makes it unlikely for the alcohol to be the main driven force of the spike in mortality (see Pridemore et al. 2013, Shkolikov et al. 2013, Yakovlev 2018).

All the arguments discussed above, allow us to claim that our findings can be extrapolated on a broader set of events or, in other words, are externally valid.

The paper proceeds as follows. In the next section, we discuss the literature. Section 3 describes the institutional environment. Sections 4 and 5 present the data, empirical methodology and results. Section 6 provides robustness checks. Section 7 concludes the paper.

2 Related literature

Simple cross-country correlation between the income level and mortality or life expectancy shows a direct connection: the richer the country, the lower the mortality rate and the higher life expectancy (see, for example, Pritchett and Summers 1996). However, the literature suggests that the causal relationship does not necessarily follow this correlation. Indeed, there is no clear answer to the question of how an economic downturn would affect mortality. Depending on a country's level of development, severity of the crisis, and some other determining factors, a crisis can lead to a decrease, increase, or have no statistically significant effect on mortality.

In developed countries, as a rule, recessions either do not affect mortality or, on average, reduce it. For instance, Ruhm (2000, 2003) showed pro-cyclical mortality in the United States. During the recession, people gave up many unhealthy habits. As a result, mortality associated diseases caused by unhealthy behaviors such as smoking or alcohol-related and obesity and cardiovascular diseases decreased, reducing overall mortality. Later works showed either the absence of a correlation between mortality and recessions in developed countries (see Ruhm 2015 and Banerjee, Duflo, Postel-Vinay, and Watts 2010), or found similar to Ruhm (2000, 2003) effect (see Miller, Page, Huff Stevens, and Filipski 2009 and Dehejia and Lleras-Muney 2004). In poorer countries, there are reasons to believe that economic downturns may have a stronger negative impact (Sen 1981, Drèze and Sen 1989). Population health may be at risk due to lower income and government protection of the population, and due to credit constraints and other market imperfections that hinder the ability to mitigate economic shocks (see Sen 1981, Behrman and Deolalikar 1988 and Drèze and Sen 1989, Cutler et al. 2002). As a result, crises result in food quality deterioration, especially among poor, low attention to preventive medical services and lack of funds for medicines and medical services. Furthermore, stress, possible job loss, disruptions and worse quality of medical healthcare due to staff shortages, and lower government spending on the healthcare system during particularly severe economic downturns lead to an increase in mortality in times of recessions and crises. Most of the evidence from low-income countries supports this idea (see Baird, Friedman, and Schady 2011, Cutler et al. 2002, Paxson and Schady 2005). The only notable exception to this series of works is Miller and Urdinola (2010), which shows the pro-cyclicality of infant mortality in Colombia.

Finally, the most sizable effect of economic shocks on mortality is documented for Russia during the economic crisis following the collapse of the USSR (see Brainerd and Cutler 2005; Brainerd 2001; Jensen and Richter 2004; Bhattacharya, Gathmann, and Miller 2013; Leon, Chenet, Shkolnikov et al. 1997; Shkolnikov, McKee, and Leon 2001). The collapse of the USSR led to a more than 40% surge in the mortality among the working-age population. A significant part of this effect was due to concurrent end of the Gorbachev anti-alcohol campaign and liberalization of the alcohol market. Our paper continues this series of works.

We focus our analysis on the elderly for several reasons. First, the aged population suffered

the most from the COVID-19 pandemic, and at the same time, is the most vulnerable to economic downturns. The literature suggests that the elderly, infants and children suffer most during crises. However, as Cutler et al. (2002) noted, public health and social security programs that usually mitigate negative consequences of economic downturns tend to focus on infants and children rather than on the elderly because, in particular, the latter interventions require significantly more medical and other resources. Second, alcohol-related deaths are less prevalent among elderly than among the working-age population in Russia. Therefore, we can extrapolate our results to a broader set of crises that act under different regulation environments and are caused by various financial, political, and epidemiological reasons. Third, changes in the health of the elderly do not onset the crises we study, as the retired population's participation in economic activities is marginal (see Cutler et al. 2002). In this regard, we have an additional argument supporting the causal interpretation of our results.

According to our analysis, after the USSR collapse, mortality increased by 20 and 15 percent for men and women, respectively. During the Great Recession, mortality rose by 3.5 and 2.9 percent. Since the fall in GDP after the collapse of the USSR was five times greater than during the Great Recession, the GDP elasticity of mortality is comparable in both cases: a 10% drop in GDP leads to a 3% increase in mortality.

Similar to previous studies, we document a rise in alcohol-related mortality. Moreover, it increases significantly higher in magnitude than total mortality: alcohol-related mortality increases by 75 percent for both males and females after the collapse of the Soviet Union and by 7 and 5 percent during the Great Recession. We also find an increase in mortality from cardiovascular diseases and cancer. These two causes account for more than 80% deaths among the elderly. Mortality from cardiovascular diseases that accounts for more than 60% of total death among the elderly rises with the same rate as total mortality. Using micro-level data, we also find that several important health status indicators deteriorate during the crisis years. Namely, we see an increase in the incidence of chronic diseases, a decrease in self-reporting health status, and a decrease in BMI and body weight among the elderly. We also show that the elderly reduce their medical spending, and that a number of medical facilities shrinks during crisis time. All these results suggest that limited access to

healthcare and stress are essential determinants of the increase in mortality during the crisis.

Thus, our study contributes to the discussion of the effect of economic downturns on health by documenting that economic downturns consistently increased the mortality among the elderly in a middle-income country, Russia.

3 Institutional environment

3.1 Two Crises. Historical Overview.

In Russia's post-Soviet history, there were two episodes when Russia's GDP fell significantly, the economic crisis of the 1990s that followed the collapse of the Soviet Union and the Great Recession of 2008-2010.

The economic crisis of the 1990s resulted in a more than a twofold drop in real GDP (see Figure 1). According to statistics from the Maddison project database, in 1990, the GDP per capita in Russia was $ 18,300 (in 2011 dollars). In 1996, the GDP per capita in Russia fell to $ 8,500 and began to grow only after the 2000s. The economic downturn during the Great Recession was smaller. In 2009, the GDP per capita fell by 10% compared to 2008, though real incomes and employment were hit harder (see Figure 2). According to Rosstat, the unemployment rate rose from 6.2 to 8.3, the number of unemployed people grew by 75%, and the average real wage fell by 25%. Another difference between the two crises is the speed of economic recovery after them. The fall in GDP and rise in unemployment during the Great Recession of 2008-2010 were short-lived; GDP returned to its pre-crisis level two years later, in 2010, while unemployment and real wages recovered in 2011. On the contrary, the crisis caused by the collapse of the USSR lasted significantly longer: the economy began to grow ten years after the crisis.

3.2 Trends in Life Expectancy

Figure A1 in the Appendix shows the change in life expectancy in Russia over the last 40 years. In the 1970s and early 1980s, life expectancy at birth in Russia was 68 years. Gorbachev's anti-alcohol campaign started in 1985 and resulted in a jump in life expectancy by two years. In 1991,

the Collapse of the USSR and the simultaneous end of the Gorbachev anti-alcohol campaign led to a surge in mortality and an unprecedented drop in life expectancy by five years. Life expectancy dropped to 65 years and began to rise only after 2004. Recent studies show that increasing trend in life expectancy that began in 2004 is due to the tightening of alcohol regulations (see Pridemore et al. 2013, Shkolnikov et al. 2013, Yakovlev 2018), changes in health-related habits (see Kueng and Yakovlev 2020), reforms in the Russian healthcare system, and general improvements in healthcare and medical technologies (see Shkolnikov et al. 2013). The Great Recession occurred concurrently with the described decreasing trend in mortality and an increasing trend in life expectancy.

4 Data and variables definition.

We use data on age-specific mortality for Russian regions for the period 1989-2017. The data is publicly available in the Russian database on fertility and mortality (RBDiS) (see http://www.demogr.nes.ru/index.php/
As additional tools, we use regional socioeconomic indicators provided by the Federal State Statistics Service (Rosstat) (see www.gks.ru), and individual-level survey, RLMS (Russian Longitudinal Monitoring Survey, see https://www.hse.ru/en/rlms/). RLMS is the annual representative survey of more than 10,000 individuals designed to monitor health and economic welfare of households and individuals.

Rosstat and RLMS data are available from 1994; therefore, we restricted employing this data only for the analysis of the Great Recession episode. In our baseline specification, we look at males and females aged 60 to 84. The statutory retirement age in Russian is 60 and 55 for men and women, respectively. We choose a common threshold for both groups (age 60) for exposition purposes.

Together with overall mortality, we use cause-specific mortality from the following causes of death, alcohol-related mortality, homicides, cardiovascular diseases, and cancer. The measures are constructed using ICD-9 and ICD-10 classifications for the collapse of the USSR and the Great Recession respectively. We use two definitions of alcohol-related mortality, broad and narrow. In the narrow definition, we use 10 causes (according to ICD-10) that contain the word "alcohol" in their names. In the broad definition, we use a classification proposed by Rehm et al (2010) that includes 38 causes directly associated with alcohol consumption. Table A1 in the Appendix shows

ICD-9 and ICD-10 codes for Rehm et al.'s list of causes. Cardiovascular diseases are the leading cause of death among the elderly, accounting for 65 percent of deaths. The second major cause is cancer causing 16.3 percent of total deaths. Alcohol-related mortality accounts for 6.2 and 1.5 percent of deaths for broad and narrow definitions respectively.

The summary statistics of variables are shown in Table A2 in Appendix.

5 Empirical Methodology and Results

We start our analysis by documenting the rise in mortality over the time trend during the crisis years. Time trend stays for the common in the world trend in decreasing age-specific mortality due to new technological progress, improvement in health care, etc. For the Great Recession, we compare mortality rates during the crisis years (2008 to 2010) with mortality within a narrow time interval before and after the crisis (2006 to 2007 and 2011 to 2012). For the collapse of the Soviet Union, we compare mortality within a narrow 5-year time interval before the crisis (1988-1992) with mortality during the first years of crisis (1993-1996). Even though the crisis followed the collapse of the USSR lasted longer, the GDP had fallen until 2000, we concentrate on initial years of crisis because in this case we can argue in this case that crisis rather than other factors (that can also change over the longer time horizon) affect mortality. The detailed regression specification is as follows:

$$Y_{rt} = \alpha + \beta Crisis_t + T_t + F_r + F_r * T_t + \varepsilon_{rt} \tag{1}$$

where Y_{rt} stays for mortality rate among the elderly in a region r in a year t; a dummy variable $Crisis$ equals 1 for crises years - years 1993 to 1996 and years 2008 to 2010 for the collapse of the USSR and the Great Recession, respectively; T, F_r, and $F_r * T$ are time trend, regional fixed effects, and regional time trends respectively. Time trends control for changes in mortality associated with other factors, such as technological development. For example, the Great Recession occurred against the backdrop of a general decrease in mortality associated with tightening regulations of the alcohol market, which began in 2005, the development and adaptation of medical technologies, change in health-related habits and economic growth that preceded the crisis. Error terms are clustered at the

regional level.

Figures 3 and 4 demonstrate what we aimed to quantify in these regressions. They show an increase in mortality over the trends in years followed the collapse of the USSR and during the Great Recession, respectively. According to Figure 3, in the first four years following the USSR collapse, the mortality among the elderly increased by 20%. In 1994, mortality reached the peak and exceeded the pre-crisis level by 27% for men and 19% for women. Figure 4 shows changes in mortality rates in the Great Recession. The Great Recession occurred concurrently with an overall increase in life expectancy and a drop in mortality. Figure 4 shows that during the Great Recession of 2008-2010, mortality exceeded predicted trend values by 3%. Accordingly, tables 1 to 4 present a quantitative assessment of the results shown in the graphs. Table 1 shows overall mortality impact of the collapse of the USSR among the elderly. The crisis led to an increase in mortality by an average of 20% for men and 15% for women in the first four years of the crisis. Table 2 demonstrates estimates for mortality growth during the years of the Great Recession (2008-2010). The mortality rate in the Great Recession increased by an average of 3.5% for men and 2.9% for women.

Tables 3 and 4 quantify the effect of the crises on cause-specific mortality rates, such as alcohol-related mortality, homicides, mortality from cardiovascular diseases, and cancer. Both crises resulted in an increase in mortality for all of these causes, with a disproportionally higher rise in alcohol-related mortality. Thus alcohol-related mortality (in narrow definition) rose by 75% after the collapse of the USSR, and by 7% during the Great Recession.[1] The increase in mortality from cardiovascular diseases was the same as the increase in overall mortality. The result is consistent with the existing literature, as the rise in cardiovascular mortality during economic downturns is documented in other developing countries (see, for example, Cutler et al. 2002).

Regression (1) employs only temporal variation. For further analysis and to verify the robustness of the results, we use regional differences in the crisis scale. In the regions most affected by the crisis, mortality is predicted to increase to a greater extent. For this analysis, we employ the following regression specification:

[1]The rise in alcohol-related mortality measured according to the broad definition is smaller in magnitude. It constitutes 35% and 1% for the collapse of the USSR and the Great Recession, respectively.

$$Y_{rt} = \alpha + \gamma Z_{rt} + T_t + F_r + F_r * T_t + \varepsilon_{rt} \quad (2)$$

where Z_{rt} stands for regional economic characteristics including log unemployment level, log gross regional product per capita (log GRP) in a region r in a year t, T stands for time trend, and F_r and $F_r T_t$ stand for regional fixed effects and regional-specific time trends respectively. Error terms are clustered at the regional level. The coefficient of interest γ shows relative growth in mortality in regions most affected from an economic downturn. The regression (2) is estimated only for the Great Recession period because data on regional characteristics are unavailable before 1994. The time span for this regression is the same as in (1), from 2006 to 2012.

Table 5 shows the results of the regressions (2). It shows that a 10% increase in the unemployment rate during the crisis resulted in a 0.4% increase in mortality, and a 10% decrease in gross regional product led to a 1% increase in mortality rate. Table 6 shows the results for cause-specific mortality. For both sexes, an increase in the unemployment rate and a drop in GRP result in an increase in mortality from cardiovascular diseases and alcohol-related mortality. For females, they also result in a statistically significant rise in homicides and mortality from cancer.

We further provide robustness checks and tests of suggestive mechanisms of how the crisis may affect health. While mortality usually serves as a primary objective measure of population health, it has two drawbacks. It may react to changes in the economic environment with a time lag, and it does not account for differences in health status and quality of life for those who survive a crisis. Thus for robustness checks, we utilize the RLMS survey and look at how several essential health indicators changed during the Great Recession. Namely, we check how the risk of having major chronic diseases, the subjective health evaluation, the BMI (body mass index), and personal weight change over the crisis. Table 7 shows the results of the individual-level regression equivalent to the specification (1). It shows that the Great Recession resulted in a deterioration in all the health outcomes discussed above, with the most notable changes in the probability of having a chronic disease. A share of people that reported having chronic diseases increased by 5 pp.

The literature suggests several possible mechanisms how the crisis may affect the mortality among the elderly (see Cutler et al. 2002, Brainerd and Cutler 2005 for discussion). First, a crisis may lead

to income reduction. With credit constraints, income fall may reduce medical spending and food consumption. The second mechanism is a decrease in public spending, including social security and healthcare spending along with shrinkage of the healthcare providers' sector. These two channels particularly affect the elderly because they suffer the most from the limited access to healthcare services and from poor nutrition. The third channel is an increase in alcohol consumption. Stress and uncertainty may increase hazardous alcohol drinking. Moreover, a populist government in order to reduce political tensions that emerge during the crisis time might attempt to soften regulations of the alcohol market and thus facilitate alcohol consumption and alcohol-related mortality further (see Triesman, 2010). Previous literature suggests that these factors played an essential role during the post-USSR crisis (see Brainerd and Cutler 2005, Bhattacharya et al., 2012). Finally, other possible mechanisms include reduced assistance of family members (as family members that previously helped the elderly have to spend more time at work during the crisis) and work stress among the elderly (because elderly people themselves have to work to help their families during hard times).

Tables 8 and 9 provide suggestive evidence for these mechanisms during the Great Recession. Table 8 shows the results of regional-level regressions for several important factors that are potentially responsible for changes in mortality. Panel A of Table 8 shows that the number of hospital beds per capita and the number of doctors per capita reduce during the Great Recession. It also shows that the average real pension decreased, and the real price of vodka drops (over the trend) during the recession years. Columns 1 to 4 and 6 to 9 of Panel B show that after controlling for regional time trends, all of these factors are negatively correlated with mortality, although coefficients are statistically insignificant. Columns 5 and 10 of Panel B show the results of regressions where we include all factors together, and control for time trends, changes in GRP and unemployment rates. Again, columns 5 and 10 show that all factors negatively correlate with mortality. Table 9 utilizes data from the individual survey (RLMS) and shows that the elderly spent less on healthcare services during the crisis years; and, at the same time, consumed more alcohol. The detailed study of the channels through which a recession affects mortality as well as other health impacts of the crisis is a task for future research.

5.1 Elasticity with respect to GDP drop

To compare the relative effect of income fall on mortality, we calculated rough speculative estimates of the elasticity of mortality with respect to the maximum drop in national GDP. The maximum decline in GDP was 50% after the collapse of the USSR, and it was 10% during the Great Recession. Mortality after the USSR collapse increased by 20% for men and 15% for women. Therefore, the elasticity of mortality with respect to GDP for the USSR collapse was 0.4 for men and 0.3 for women. Mortality during the Great Recession increased by 3.5% for men and 2.9% for women. Thus GDP elasticity of mortality was 0.35 for men and 0.29 for women. These rough calculations show that the growth rate of overall mortality is comparable during these two crises, given their magnitude. The only elasticity estimates that differ for these two crises are those for alcohol-related mortality and violent deaths. For the Great Recession, they are smaller.

6 Robustness checks

Tables A3-A8 in the Appendix show the results of several robustness checks.

Table A3 shows the results using an alternative definition of the timing of the crisis that followed the collapse of the USSR. According to the second definition, the crisis started in 1992 rather than in 1993. In this specification, the effect of the crisis is smaller in magnitude. Figure 1 supports such results, demonstrating the growth in mortality starting in 1993 (not in 1992). Table A4 shows the results using an alternative definition of the Great Recession. While the Great Recession started globally in 2008, Figure2 suggests that it mostly hit Russia in 2009 and 2010. Thus in the alternative definition, we use only these two years (2009 and 2010) for the Great Recession. Table A4 shows similar to the main specification results.

Tables A5 and A6 show the results of regressions for the younger age cohort of the elderly (age 60-69). In the main specification, we use crude death rates for the population aged 60-84. This approach may weight older age cohorts more because they have more death counts counts and the higher burden of chronic conditions. . Thus, alternative estimates for another age range, 60 to 69, are presented in the robustness check section. Both age specifications give qualitatively similar results.

Table A7 presents the results of regressions using model (1) with different time windows for pre- and post-crisis periods in the analysis of the Great Recession. We compare mortality rates during the Great Recession (2008-2010) with pre- and post-crisis years with a time window that varies from 1 year before and after (2007 and 2012) to 6 years (from 2002 to 2007 and from 2011 to 2016). Table A7 shows a statistically significant increase in mortality during the Great Recession for all specifications, and that effect becomes higher in magnitude with an increase in the time horizon for control years. Unfortunately, we could not perform the same robustness check for the USSR Collapse because regional-level data on mortality is unavailable before 1989.

Table A8 shows results of Difference-in-Difference regression results comparing growth in mortality among the elderly relative to that among working-age population (ages 20-44) during the Great Recession.[2] This identification strategy is used in Cutler et al. 2002 for Mexico. Table A8 shows that the mortality among the elderly increases by 4.6% and 3.1% compared to that for young cohorts (for men and women respectively). The use of the young population (age 20-44) as a control group would be problematic for the analysis of the USSR collapse because the literature documents an increase in alcohol-related mortality for this cohort during this episode. However, as we argued before because of tightening alcohol market regulation and absence of postponed mortality, the Great Recession provides a better setting for the DID analysis. Indeed, Table A8 also shows that the mortality of the young cohort does not increase during the Great Recession (it decreases by 1% for men and stays the same for women).

7 Conclusion

In our paper, we assess the short-term effect of the two largest crises in Russia (the crisis after the collapse of the USSR and the Great Recession of 2008-2010) on the mortality among the elderly. According to our analysis, both crises have led to an increase in mortality. After the collapse of the USSR, mortality increased by 20 and 15 percent for men and women, respectively. During the

[2]The regression specification is as follows:
$Y_{rta} = \alpha + \gamma Age(60-84)_a Crisis_t + \delta Age(60-84)_a + \beta Crisis_t + T_t + F_r + F_r * T_t + \varepsilon_{rt}$, where $Age(60-84)_a$ equals 1 for age group 60-84 and 0 otherwise. Other variables are the same as in model (1) for the Great Recession. The model uses data on two age groups, age 60-84 and age 20-44. Errors are clustered at regional level.

Great Recession, mortality rose by 3.5 percent for men and 2.9 percent for women. Since the fall in GDP after the USSR collapse was five times greater than during the Great Recession, the GDP elasticity of mortality by is comparable in both cases. According to our study, a 10% drop in GDP leads to a 3% increase in mortality among the elderly. In further analysis of the Great Recession we find evidence that economic depreciation, deterioration of social security and medical services during the crisis years, and, to smaller extent, softening regulation of alcohol market are responsible for the excessive mortality among the elderly.

References

Baird, Sarah J., Jed Friedman, and Norbert Schady. "Aggregate Income Shocks and Infant Mortality in the Developing World." Review of Economics and Statistics 93, no. 3 (August 2011): 847-856.

Banerjee, Abhijit, Esther Duflo,Gilles Postel-Vinay, and Tim Watts. "Long-Run Health Impacts of Income Shocks: Wine and Phylloxera in 19th-Century France." Review of Economics and Statistics 92, no. 4 (November 2010): 714-728.

Behrman, Jere, and Anil Deolalikar. "Health and Nutrition." In Handbook of Development Economics, edited by Hollis Chenery and T. N. Srinivasan, 631-711. Amsterdam: Elsevier, 1988.

Bhattacharya, Jay, Christina Gathmann, and Grant Miller. "The Gorbachev Anti-Alcohol Campaign and Russia's Mortality Crisis."American Economic Journal: Applied Economics 5, no. 2(November 2013): 232-260.

Brainerd, Elizabeth. "Economic Reform and Mortality in the Former Soviet Union: A Study of the Suicide Epidemic in the 1990s." European Economic Review 45, no. 4-6 (May 2001): 1007-1019.

Brainerd, Elizabeth, and David M. Cutler."Autopsy on an Empire: Understanding Mortality in Russia and the Former Soviet Union." Journal of Economic Perspectives19, no. 1 (Winter 2005): 107-130.

Cutler, David M., Angus Deaton, and Adriana Lleras-Muney. "The Determinants of Mortality." Journal of Economic Perspectives 20, no. 3 (Summer 2006): 97-120.

Cutler, David M., Felicia Knaul, Rafael Lozano, Oscar Méndez, and Beatriz Zurita. "Great Recession, Health Outcomes and Aging: Mexico in the 1980s and 1990s." Journal of Public Economics

84, no. 2 (May 2002): 279-303.

Deaton, Angus. "Global Patterns of Income and Health: Facts, Interpretations, and Policies." NBER Working Paper 12735, December 2006.

Dehejia, Rajeev, and Adriana Lleras-Muney. "Booms, Busts, and Babies' Health." Quarterly Journal of Economics 119, no. 3(August 2004): 1091-1130.

Drèze, Jean, and Amartya Sen. Hunger and Public Action. Oxford: Clarendon Press, 1989.

Gallup, John Luke, and Jeffrey D. Sachs. "The Economic Burden of Malaria." American Journal of Tropical Medicine and Hygiene 64, no. 1, 2 Supplement (January 2001): 85-96.

Jensen, Robert T., and Kaspar Richter."The Health Implications of Social Security Failure: Evidence from the Russian Pension Crisis." Journal of Public Economics 88, no. 1-2 (2003): 209-236.

Kueng, Lorenz and Evgeny Yakovlev, 2020, Long-Run Consequences of Temporary Policies: Tastes and Mortality, 2020, forthcoming, American Economic Journal: Economic Policy

Lange, Simon, and Sebastian Vollmer. "The Effect of Economic Development on Population Health: A Review of the Empirical Evidence."British Medical Bulletin 121, no. 1 (January 2017): 47-60.

Leon, David A., Laurent Chenet, Vladimir M. Shkolnikov, Sergei Zakharov, Judith Shapiro, Galina Rakhmanova, Sergei Vassin, and Martin McKee. "Huge Variation in Russian Mortality Rates 1984-94: Artefact, Alcohol, or What?" Lancet 350, no. 9075 (August 1997): 383-388.

Men, Tamara, Paul Brennan, Paolo Boffetta, and David Zaridze. "Russian Mortality Trends for 1991-2001: Analysis by Cause and Region." BMJ 327, no. 7421 (October 2003): 964-969.

Miller, Douglas L., Marianne E. Page, Ann Huff Stevens, and Mateusz Filipski."Why are Recessions Good for Your Health?"American Economic Review 99, no. 2 (May 2009):122-127.

Miller, Grant, and B. Piedad Urdinola."Cyclicality, Mortality, and the Value of Time: The Case of Coffee Price Fluctuations and Child Survival in Colombia." Journal of Political Economy 118, no. 1 (February 2010): 113-155.

Paxson, Christina, and Norbert Schady. "Child Health and Economic Crisis in Peru." World Bank Economic Review 19, no. 2 (November 2005): 203-223.

Pridemore W.A., Chamlin M.B., Andreev E.. "Reduction in Male Suicide Mortality Following the 2006 Russian Alcohol Policy: An Interrupted Time Series Analysis", American Journal of Public Health: November 2013, Vol. 103, No. 11: 2021–2026.

Pritchett, Lant, and Lawrence H. Summers. "Wealthier is Healthier." Journal of Human Resources 31, no. 4 (Autumn 1996): 841-868.

Rehm, Jürgen, Dolly Baliunas, Guilherme L. G. Borges, Kathryn Graham, Hyacinth Irving, Tara Kehoe, Charles D. Parry, Jayadeep Patra, Svetlana Popova, Vladimir Poznyak, "The relation between different dimensions of alcohol consumption and burden of disease: an overview" , Addiction, 2010 May; 105(5):817-43

Ruhm, Christopher J. "Are Recessions Good for Your Health?" Quarterly Journal of Economics 115, no. 2 (May 2000): 617-650

Ruhm, Christopher J. "Good Times Make You Sick." Journal of Health Economics 22, no. 4 (July 2003): 637-658

Ruhm, Christopher J. "Recessions, Healthy No More?" Journal of Health Economics 42, no. C (July 2015): 17-28

Ruhm, Christopher J., "Economic crises and mortality", Vox CEPR policy portal, 2015

Sen, Amartya. Poverty and Famines: An Essay on Entitlement and Deprivation. Oxford: Clarendon Press, 1981.

Shkolnikov, Vladimir M., Martin McKee, and David A. Leon. "Changes in Life Expectancy in Russia in the Mid-1990s." Lancet 357, no. 9260 (April 2001): 917-921.

Shkolnikov Vladimir M., Evgeny Andreev, Martin McKee, and David A. Leon, "Components and possible determinants of the decrease in Russian mortality in 2004-2010". Demographic Research. 2013. Vol. 28, Art. 32, pp. 917-950

Triesman, Daniel, 2010, "Death and Prices: The Political Economy of Russia's Alcohol Crisis", Economics of Transition, 18, 2, April 2010

Van den Berg, Gerard J., Maarten Lindeboom, and France Portrait. "Economic Conditions Early in Life and Individual Mortality." American Economic Review 96, no. 1 (March 2006): 290-302.

World Health Organization. "Macroeconomics and Health: Investing in Health for Economic

Development." 20 December 2001, https://apps.who.int/iris/handle/10665/42463.

Yakovlev, Evgeny, 2018, "Demand for Alcohol Consumption in Russia and Its Implication for Mortality", 2018, American Economic Journal: Applied Economics, 10(1):106-49.

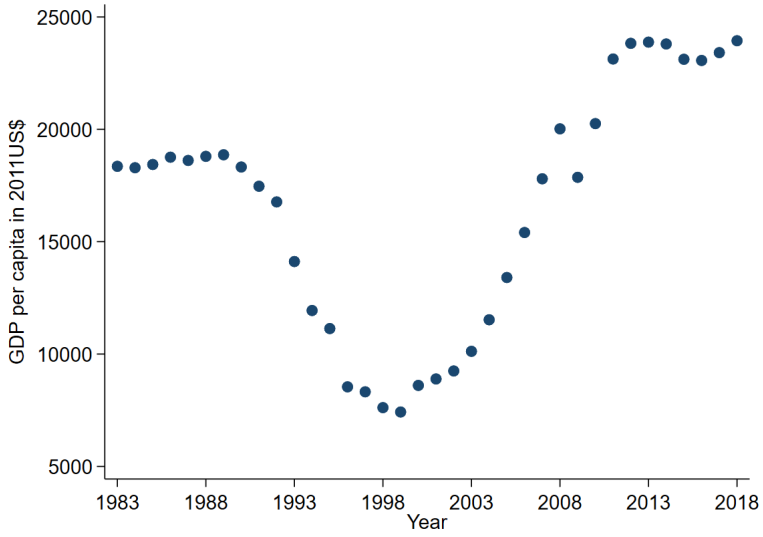
Russian Fertility and Mortality Database (RFMD), http://www.demogr.nes.ru/index.php/ru/demogr_indicat/

Maddison project database, 2018, https://www.rug.nl/ggdc/historicaldevelopment/maddison/releases/maddiso project-database-2018

Russian Federal Statitical Agency Database, Rosstat, www.gks.ru

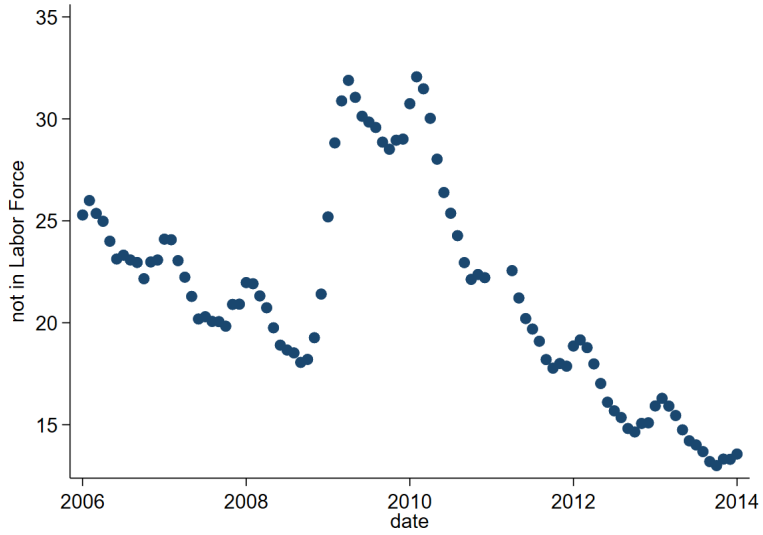
Tables and Figures

Figure 1: Russian GDP, by PPP, in US 2011 dollars



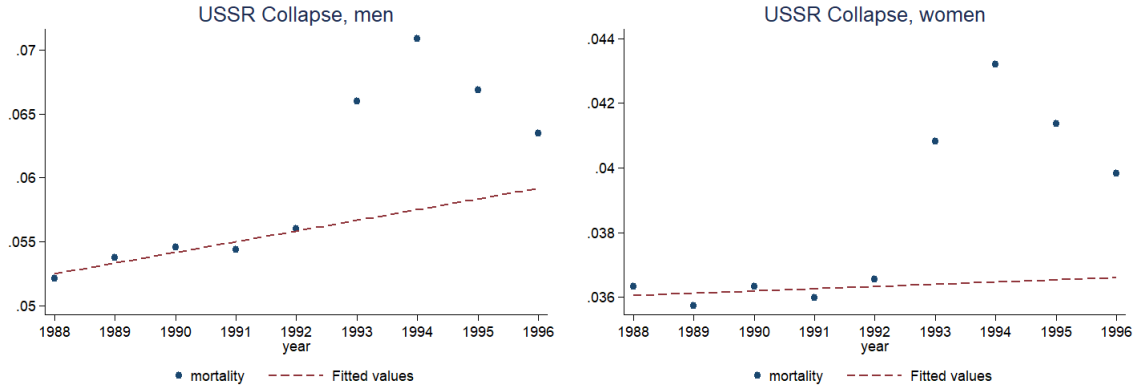
Source: Maddison project database, 2018

Figure 2: Number of people not in labor force during the Great Recession of 2008-2010



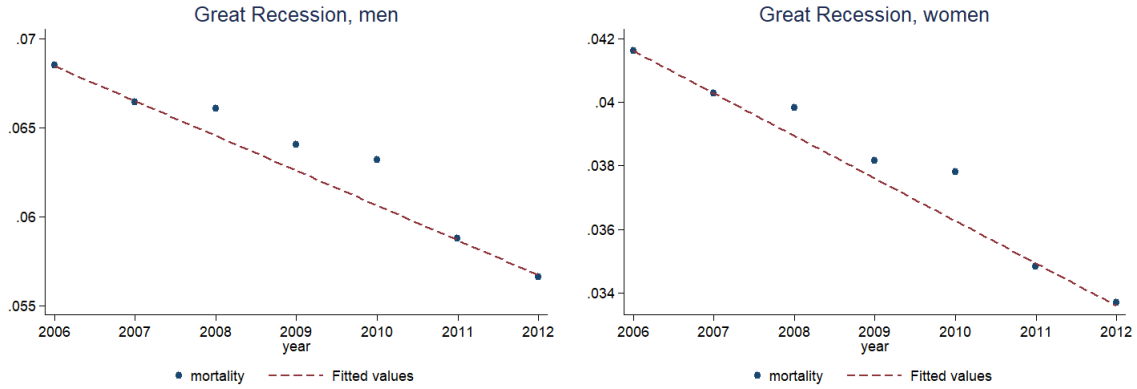
Source: Rosstat.

Figure 3: Mortality after the Collapse of Soviet Union



Notes: Figure shows mortality rates for females at age 60-84 for men (left figure) and women (right figure) Dashed line shows liner prediction using control years (1988-1992).

Figure 4: Mortality in the Great Recession



Notes: Figure shows mortality for females at age 60-84 for men (left figure) and women (right figure) Dashed line shows liner prediction using control years (2006-2007 and 2011-2012).

Table 1: Mortality after the Collapse of the USSR

	(1)	(2)	(3)	(4)	(5)	(6)
	Log Mortality, men			Log Mortality, women		
Collapse of USSR	0.206***	0.202***	0.202***	0.148***	0.144***	0.143***
	(0.0075)	(0.0076)	(0.0079)	(0.00606)	(0.00568)	(0.006)
Time trend	0.0001	0.0015		-0.0008	0.0009	
	(0.0018)	(0.0014)		(0.0019)	(0.0015)	
Constant	-3.106	-5.947**	35.17***	-1.685	-5.154*	42.38***
	(3.603)	(2.847)	(3.021)	(3.801)	(3.087)	(2.276)
Observations	623	623	623	623	623	623
R-squared	0.475	0.891	0.924	0.34	0.892	0.923
Trend	YES	YES		YES	YES	
Region FE		YES	YES		YES	YES
Regional Time trends			YES			YES

Notes. Robust errors clustered by regions are in parentheses. Mortality is calculated for age 60-84. *** p<0.01, ** p<0.05, * p<0.1.

Table 2: Mortality during the Great Recession

	(1)	(2)	(3)	(4)	(5)	(6)
	Log Mortality, men			Log Mortality, women		
Great Recession	0.0347***	0.0347***	0.0347***	0.0289***	0.0289***	0.0289***
	(0.00216)	(0.00233)	(0.00255)	(0.00317)	(0.00342)	(0.00374)
Time trend	-0.029***	-0.029***		-0.033***	-0.033***	
	(0.00106)	(0.00115)		(0.00152)	(0.00164)	
Constant	69.47***	68.98***	104.8***	76.51***	76.20***	108.9***
	(2.142)	(2.309)	(0.0011)	(3.054)	(3.293)	(0.0016)
Observations	560	560	560	560	560	560
R-squared	0.169	0.963	0.979	0.291	0.907	0.954
Trend	YES	YES		YES	YES	
Region FE		YES	YES		YES	YES
Regional Time trends			YES			YES

Notes. Robust errors clustered by regions are in parentheses. Mortality is calculated for age 60-84. *** p<0.01, ** p<0.05, * p<0.1.

Table 3: Cause-specific mortality, collapse of Soviet Union

	(1)	(2)	(3)	(4)	(5)	(6)
	Log Mortality, men			Log Mortality, women		
Alcohol-related Mortality,	0.754***	0.729***	0.732***	0.780***	0.746***	0.745***
, narrow definition	(0.0588)	(0.0636)	(0.0672)	(0.0724)	(0.08)	(0.0863)
Alcohol-related Mortality,	0.399***	0.399***	0.402***	0.315***	0.316***	0.323***
, broad definition	(0.0224)	(0.0270)	(0.0278)	(0.0270)	(0.0300)	(0.0316)
Homicides	0.444***	0.482***	0.494***	0.375***	0.370***	0.372***
	(0.0555)	(0.0626)	(0.0687)	(0.0561)	(0.0565)	(0.0617)
Cardiovascular diseases	0.240***	0.233***	0.232***	0.174***	0.167***	0.166***
	(0.0118)	(0.0103)	(0.011)	(0.0096)	(0.0086)	(0.0093)
Cancer	0.0247***	0.0250***	0.0259***	0.0150**	0.0150**	0.0148*
	(0.0073)	(0.0076)	(0.00879)	(0.0071)	(0.00705	(0.0076)
Trend	YES	YES		YES	YES	
Region FE		YES	YES		YES	YES
Regional time trends			YES			YES

Notes. Robust errors clustered by regions are in parentheses. Mortality is calculated for age 60-84
*** p<0.01, ** p<0.05, * p<0.1.

Table 4: Cause-specific mortality, the Great Recession

	(1)	(2)	(3)	(4)	(5)	(6)
	Log Mortality, men			Log Mortality, women		
Alcohol-related Mortality,	0.0946***	0.0695***	0.0695***	0.0452*	0.0563**	0.0511*
narrow definition	(0.03)	(0.0227)	(0.0248)	(0.0243)	(0.0267)	(0.0289)
Alcohol-related Mortality,	0.0181*	0.0181*	0.0181	-0.00951	-0.00951	-0.00951
broad definition	(0.00988)	(0.0107)	(0.0117)	(0.0126)	(0.0136)	(0.0148)
Homicides	0.0513*	0.0523	0.0527	-0.00116	0.0181	0.016
	(0.0297)	(0.032)	(0.035)	(0.0399)	(0.0387)	(0.0428)
Cardiovascular diseases	0.0420***	0.0420***	0.0420***	0.0352***	0.0352***	0.0352***
	(0.00444	(0.0048)	(0.00525)	(0.00459)	(0.00495)	(0.00542)
Cancer	0.0154***	0.0154***	0.0154***	0.0129**	0.0129*	0.0129*
	(0.00456)	(0.00492)	(0.00539)	(0.00607)	(0.00655)	(0.00717)
Trend	YES	YES		YES	YES	
Region FE		YES	YES		YES	YES
Regional Time trends			YES			YES

Notes. Robust errors clustered by regions are in parentheses. Mortality is calculated for age 60-84. *** p<0.01, ** p<0.05, * p<0.1.

Table 5: Mortality during the Great Recession. Regional variation.

	(1)	(2)	(3)	(4)	(5)	(6)
	Log mortality, men					
Log unemployed	0.0229***	0.0471***				
	(0.007)	(0.007)				
Log unemployment rate			0.0199***	0.0443***		
			(0.0068)	(0.0064)		
Log GRP per capita					-0.058***	-0.101***
					(0.0171)	(0.016)
Constant	69.16***	104.7***	69.46***	104.0***	64.14***	104.5***
	(1.916)	(0.0246)	(1.921)	(0.125)	(2.557)	(0.061)
Observations	546	546	546	546	546	546
R-squared	0.96	0.973	0.96	0.973	0.96	0.971
Time Trend	YES		YES		YES	
Region FE	YES	YES	YES	YES	YES	YES
Regional Time Trends		YES		YES		YES
	(7)	(8)	(9)	(10)	(11)	(12)
	Log mortality, women					
Log unemployed	0.0211**	0.0398***				
	(0.0095)	(0.0072)				
Log unemploym. Rate			0.0143*	0.0377***		
			(0.0084)	(0.0066)		
Log GRP per capita					-0.043*	-0.114**
					(0.026)	(0.0442)
Constant	78.51***	108.8***	78.83***	108.2***	74.84***	108.5***
	(2.413)	(0.0255)	(2.409)	(0.13)	(3.502)	(0.169)
Observations	546	546	546	546	546	546
R-squared	0.93	0.956	0.93	0.956	0.93	0.956
Time Trend	YES		YES		YES	
Region FE	YES	YES	YES	YES	YES	YES
Regional Time Trends		YES		YES		YES

Notes. Robust errors clustered by regions are in parentheses. Mortality is calculated for age 60-84. *** p<0.01, ** p<0.05, * p<0.1.

Table 6: Cause-specific mortality during the Great Recession. Regional variation.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Log Mortality, men				Log Mortality, women			
	alcohol-related	cardio-vascular	homi-cides	cancer	alcohol-related	cardio-vascular	homi-cides	cancer
Log unemployed	0.178***	0.047***	0.136	0.0208	0.106*	0.043***	0.219*	0.039**
	(0.0612)	(0.0122)	(0.0961)	(0.013)	(0.0615)	(0.0133)	(0.116)	(0.0163)
Log unemploy-ment rate	0.175***	0.045***	0.105	0.0132	0.107*	0.040***	0.239**	0.035**
	(0.0594	(0.011)	(0.0934	(0.0118)	(0.0592)	(0.013)	(0.117)	(0.0148)
Log GRP per capita	-0.571***	-0.095***	0.13	-0.0323	-0.766***	-0.096*	-0.72**	-0.13***
	(0.172	(0.029)	(0.284)	(0.0504)	(0.229)	(0.0541)	(0.278)	(0.0371)
Observations	539	539	540	539	537	537	528	537
R-squared	0.933	0.933	0.933	0.93	0.922	0.922	0.924	0.922

Note: Robust standard errors clustered by regions in parentheses; *** p<0.01, ** p<0.05, * p<0.1.
All regressions unclude regional fixed effects and regional time trends.

Table 7: Selected health indicators of elderly people during the Great Recession

	(1)	(2)	(3)	(4)	(5)	(6)
	Share with chronic diseases			Subjective health status (1=very good, 5=very bad)		
Great Recession	0.0515***	0.0516***	0.0509***	0.0282**	0.0268*	0.0273*
	(0.00757)	(0.0075)	(0.0074)	(0.0135)	(0.0134)	(0.0136)
Time Trend	-0.0089***	-0.0092***		-0.0185***	-0.0182***	
	(0.003)	(0.003)		(0.0042)	(0.0037)	
Constant	18.63***	19.16***	32.45***	40.44***	39.73***	12.04***
	(6.104)	(6.074)	(0.161)	(8.454)	(7.601)	(0.423)
Observations	22,299	22,299	22,299	20,800	20,800	20,800
R-squared	0.02	0.052	0.061	0.017	0.074	0.08
Time trend	YES	YES		YES	YES	
Region FE		YES	YES		YES	YES
Regional time trends			YES			YES

	(7)	(8)	(9)	(10)	(11)	(12)
	Log body weight			BMI (body mass index)		
Great Recession	-0.0065**	-0.0062**	-0.0064**	-0.315***	-0.314***	-0.313***
	(0.0025)	(0.0024)	(0.0024)	(0.074)	(0.073)	(0.073)
Time Trend	0.00567***	0.00548***		0.0820***	0.0756***	
	(0.00082)	(0.0008)		(0.0211)	(0.0215)	
Constant	-7.100***	-6.710***	-10.84***	-136.3***	-123.9***	-150.7***
	(1.664)	(1.621)	(0.052)	(42.36)	(43.19)	(1.49)
Observations	21,065	21,065	21,065	20,663	20,663	20,663
R-squared	0.005	0.027	0.031	0.002	0.013	0.015
Time trend	YES	YES		YES	YES	
Region FE		YES	YES		YES	YES
Regional time trends			YES			YES

Note: Robust standard errors clustered by regions in parentheses; *** p<0.01, ** p<0.05, * p<0.1. BMI is calculated using formula $bmi = (weight\ in\ kg)/(height\ in\ metrs)^2$. The model uses RLMS survey for years 2006-2012.

Table 8: Cause-specific mortality during the Great Recession. Regional variation.

Panel A	(1) log hospital beds pc	(2) log doctors per capita	(3) log real pension	(4) log vodka price
Great Recession	-0.0457***	-0.0118**	-0.0253***	-0.0805***
	(0.00459)	(0.00531)	(0.00125)	(0.00493)
Constant	62.81***	-7.740**	-253.1***	-24.37***
	(4.482)	(3.442)	(0.601)	(5.390)
Observations	539	461	539	537
R-squared	0.618	0.076	0.95	0.293
Number of reg	77	77	77	77

Note: Robust errors clustered by regions in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Panel B

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	log Mortality, Men					log Mortality, Women				
log hospital beds	-0.241***				-0.167***	-0.203***				-0.166***
per capita	(0.0422)				(0.037)	(0.035)				(0.045)
log price vodka		-0.172***			-0.126***		-0.115***			-0.063**
		(0.019)			(0.023)		(0.023)			(0.029)
log real pension			-0.0266		-0.049**			-0.0275		-0.047***
			(0.018)		(0.021)			(0.0222)		(0.017)
log doctors per				-0.0904					-0.0953	
capita				(0.072)					(0.077)	
log GRP pc					-0.077***					-0.109***
					(0.015)					(0.041)
log unemploy-					8.98e-05					6.88e-05
ment rate					(0.007)					(0.0094)
Observations	539	461	539	537	537	539	461	539	537	537
R-squared	0.87	0.792	0.851	0.89	0.91	0.882	0.828	0.872	0.898	0.91

Note: Robust errors clustered by regions in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 9: Cause-Specific Mortality During the Great Recession. Regional Variation.

	(1)	(2)	(3)	(4)	(5)	(6)
	paid for private medical insurance?		paid for hospitalization?		monthly alcohol intake (in grams of spirits)	
Great Recession	-0.0107***	-0.0098***	-0.0074***	-0.0074**	17.17***	17.29***
	(0.0028)	(0.0027)	(0.0026)	(0.0027)	(5.607)	(5.609)
Time Trend	0.0003		0.00116		1.579	
	(0.0009)		(0.00069)		(1.274)	
Constant	-0.508	-10.45***	-2.294	-4.223***	-3,092	-7,78***
	(1.822)	(0.01)	(1.388)	(0.0122)	(2,561)	(71.17)
Observations	12,853	12,853	12,842	12,842	23,050	23,050
R-squared	0.001	0.03	0	0.011	0	0.01
Time trend	YES		YES		YES	
Region FE		YES		YES		YES
Regional time trends		YES		YES		YES

Note: Robust standard errors clustered at regional level are in parentheses;
*** p<0.01, ** p<0.05, * p<0.1

APPENDIX

Figure A1. Life expectancy in Russia

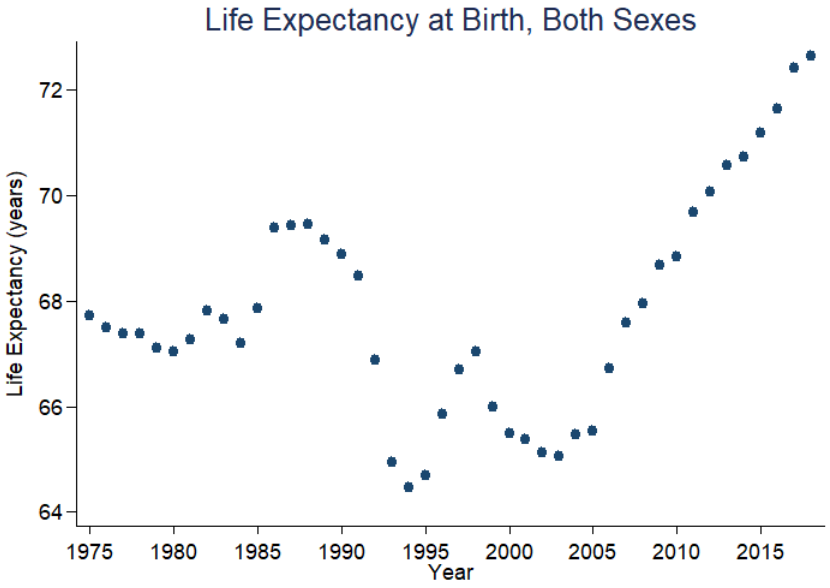


Table A1. List of ICD (International Classification of Diseases) codes for cause-specific mortality

	ICD-9 (Collapse of the USSR)	ICD-10 (Great Recession)
Cardiovascular diseases	410-453	All I codes except I42.6
Cancer	140-208	All C codes
Homicides	960-978	X85-V09
Alcohol-related mortality: broad definition	290-303, 305-316, 330-337, 341-344, 346-380, 384-389, 535, 570-571.4, 571.8-573, 575.2-577, 749-751, 780-796, 798, 799, 850-869, 950-959, 980-989	E00-E07, E15-E16, E20-E35, F10.0-F10.9, G10-G12, G23-G25, G31, G36, G37, G43-G45, G47, G50-G72, G81-G98, I42.6, K29, K70, K85-K86, R00-R53, R55-R94, R96-R99, T36-T65, X45, X60-X84, Y10-Y34
Alcohol-related mortality: narrow definition	291, 303, 860	F10.0-F10.9, K70, X45, G31.2, I42.6, K86.0

Table A2 Summary statistics

Panel A. The collapse of the USSR (1985-1996)

Cause	N	Mean	St.Dev	Min	Max
Male mortality, 60-84 (per 1 mln)					
Total	623	61778.43	9537.264	38144.84	102721.4
Alcohol, narrow	623	566.56	576.20	0	4072.7
Alcohol, broad	623	2975	1,634	890.2545	12486.59
Cardio diseases	623	34989	6485.46	21138.24	61896.46
Homicide	623	314.72	284.99	0	3395.23
Cancer	623	12730.47	1954.15	5575.592	19930.48
Female mortality, 60-84 (per 1 mln)					
Total	623	39279.85	4999.30	24804.37	60276.06
Alcohol, narrow	621	164.31	271.80	0	3436.76
Alcohol, broad	623	1038	607	328.28	6873.41
Cardio diseases	623	27294.65	4173.4	14129.95	42583.87
Homicide	622	122.83	91.36	0	872.25
Cancer	623	5471.05	1169.47	2423.69	16703.55

Notes: The sample includes 73 regions in 1989, 78 regions in 1990-1994, 79 regions in 1995-1996 and Russia as the whole country in 1985-1988. The sample covers period between 1985-1996

Panel B. The Great Recession (2006-2012).

	N	Mean	St.Dev	Min	Max
Unemp Rate	560	8.524107	7.107657	.8	67.7
# Unemp.	560	63112.5	47548.41	1000	311000
Real income	556	532.1076	213.74	176.997	1524.323
Male mortality, 60-84 (on 1 mln)					
Total	560	66541.24	8897.113	31048.12	86741.02
Alcohol, narrow	558	1240.612	824.9555	0	7325.966
Alcohol, broad	560	5005.465	1963.964	1061.455	16814.35
Cardio diseases	560	41041.45	6814.75	19680.64	60030.76
Homicide	560	225.9934	206.7706	0	1959.368
Cancer	560	11903.53	1674.532	4333.421	15735.84
Female mortality, 60-84 (on 1 mln)					
Total	560	39302.16	4675.474	21053.61	53045.2
Alcohol, narrow	552	318.1283	310.7229	0	2969.154
Alcohol, broad	560	1553.053	725.6706	418.4203	6142.42
Cardio diseases	560	27847.66	4479.922	13930.94	41621.34
Homicide	558	82.51411	69.33043	0	677.939
Cancer	560	5346.939	825.4422	2083.112	10679.32

Table A3. Overall Mortality with alternative definition of the USSR collapse (1992-1996)

	(1)	(2)	(3)	(4)	(5)	(6)
	Log Mortality, men			Log Mortality, women		
Collapse of the USSR	0.0964***	0.0889***	0.0872***	0.0565***	0.0490***	0.0481***
	(0.00875)	(0.00621)	(0.00641)	(0.00736)	(0.00480)	(0.00506)
Time Trend	0.0216***	0.0244***		0.0170***	0.0198***	
	(0.00266)	(0.00146)		(0.00244)	(0.00136)	
Observations	623	623	623	623	623	623
R-squared	0.386	0.805	0.839	0.266	0.823	0.855
Trend	YES	YES		YES	YES	
Region FE		YES	YES		YES	YES
Regional Time Trend			YES			YES

Notes. Robust errors clustered by regions in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A4. Overall Mortality with alternative definition of the Great Recession (2009-2010)

	(1)	(2)	(3)	(4)	(5)	(6)
	Log Mortality, men			Log Mortality, women		
Great Recession	0.0353***	0.0353***	0.0353***	0.0279***	0.0279***	0.0279***
	(0.00296)	(0.00319)	(0.00350)	(0.00417)	(0.00450)	(0.00492)
Time trend	-0.0303***	-0.0303***		-0.0338***	-0.0338***	
	(0.00107)	(0.00115)		(0.00147)	(0.00159)	
Observations	560	560	560	560	560	560
R-squared	0.167	0.961	0.977	0.288	0.904	0.950
Trend	YES	YES		YES	YES	
Region FE		YES	YES		YES	YES
Regional Time trends			YES			YES

Notes. Robust errors clustered by regions are in parentheses. ***p<0.01; **p<0.05; *p<0.1

Table A5. Overall Mortality with alternative definition of age (60-69) after the collapse of the USSR

	(1)	(2)	(3)	(4)	(5)	(6)
	Log Mortality, men			Log Mortality, women		
Collapse of the USSR	0.236***	0.235***	0.235***	0.182***	0.182***	0.181***
	(0.00789)	(0.00901)	(0.00945)	(0.00748)	(0.00842)	(0.00907)
Time Trend	0.0172***	0.0180***		0.0142***	0.0145***	
	(0.00168)	(0.00146)		(0.00178)	(0.00168)	
Observations	623	623	623	623	623	623
R-squared	0.546	0.918	0.935	0.314	0.939	0.950
Trend	YES	YES		YES	YES	
Region FE		YES	YES		YES	YES
Regional Time Trends			YES			YES

Notes. Robust errors clustered by regions in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A6. Overall Mortality with alternative definition of age (60-69) during the Great Recession

	(1)	(2)	(3)	(4)	(5)	(6)
	Log Mortality, men			Log Mortality, women		
Great Recession	0.0249***	0.0249***	0.0249***	0.0167***	0.0167***	0.0167***
	(0.00274)	(0.00296)	(0.00324)	(0.00365)	(0.00394)	(0.00431)
Time trend	-0.0475***	-0.0475***		-0.0603***	-0.0603***	
	(0.00107)	(0.00115)		(0.00150)	(0.00162)	
Observations	560	560	560	560	560	560
R-squared	0.215	0.974	0.982	0.320	0.945	0.960
Trend	YES	YES		YES	YES	
Region FE		YES	YES		YES	YES
Regional Time trends			YES			YES

Notes. Robust errors clustered by regions are in parentheses. ***p<0.01; **p<0.05; *p<0.1

Table A7. The Great Recession. Alternative choices of the analyzed time period

	(1)	(2)	(3)	(4)	(5)	(6)
Time span	2007-2011	2006-2012	2005-2013	2004-2014	2003-2015	2002-2016
			Log Mortality, Men			
Great Recession	0.0323***	0.0337***	0.0343***	0.0408***	0.0447***	0.0498***
	(0.00302)	(0.00254)	(0.00260)	(0.00284)	(0.00298)	(0.00301)
			Log Mortality, Women			
Great Recession	0.0282***	0.0281***	0.0343***	0.0453***	0.0509***	0.0570***
	(0.00414)	(0.00336)	(0.00312)	(0.00321)	(0.00328)	(0.00328)
Observations	395	553	711	869	948	1,026
Region FE	YES	YES	YES	YES	YES	YES
Region-Trend FE	YES	YES	YES	YES	YES	YES

Note: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table A8. Mortality of elderly relatively to working-age population during the Great Recession (DID regression)

	(1)	(2)	(3)	(4)	(5)	(6)
	Log Mortality, men			Log Mortality, women		
I(age 60-84)*Great Recession	0.046***	0.046***	0.046***	0.031***	0.031***	0.031***
	(0.00452)	(0.00469)	(0.00488)	(0.00727)	(0.00754)	(0.00784)
Great Recession	-0.0110**	-0.0110**	-0.0110**	-0.00199	-0.00199	-0.00199
	(0.00459)	(0.00476)	(0.00495)	(0.00681)	(0.00706)	(0.00734)
I(age 60-84)	2.293***	2.293***	2.293***	2.987***	2.987***	2.987***
	(0.0219)	(0.0227)	(0.0236)	(0.0333)	(0.0346)	(0.0360)
Time trend	-0.041***	-0.041***		-0.033***	-0.033***	
	(0.00139)	(0.00144)		(0.00152)	(0.00158)	
Constant	91.19***	90.70***	95.94***	74.76***	74.37***	86.39***
	(2.798)	(2.895)	(0.0121)	(3.063)	(3.175)	(0.0186)
Observations	1,120	1,120	1,120	1,120	1,120	1,120
R-squared	0.964	0.992	0.992	0.970	0.990	0.990
Time Trend	YES	YES		YES	YES	
Region FE		YES	YES		YES	YES
Regional Time trends			YES			YES

Notes. Robust errors clustered by regions are in brackets. ***p<0.01; **p<0.05; *p<0.1. Mortality is calculated for two age groups: 20-44 and 60-84. The regression specification is as follows:

$Y_{rta} = \alpha + \gamma Age(60-84)_a Crisis_t + \delta Age(60-84)_a + \beta Crisis_t + T_t + F_r + F_r * T_t + \varepsilon_{rt}$,

where $Age(60-84)_a$ equals 1 for age group 60-84 and 0 otherwise. Other variables are the same as in model (1).