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# The Response of Violent Mortality to Economic Crisis in Russia

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## Abstract

This paper examines the impact of violent causes of death on the dramatic rise in Russian mortality that is beyond the peacetime experience of industrialized countries. The changes in mortality from violent causes of death (including suicide, homicide and poisoning) were studied for the period 1991-1997 using Russian official vital statistics. The multiple decrement life-table method was applied to calculate the Chances per 100 of Eventually Dying (CED). During the period of economic transformations the CED from injuries increased in Russia from 15.0 in 1991 to 18.1 in 1997 for males and from 4.7 to 5.8 for females. Suicide was the most common cause of violent deaths both for males and females for the period of 1991-97. The CED for male suicide increased dramatically from 2.9 in 1991 to 3.9 in 1997, while the CED for females did not change significantly (0.85 in 1991 and 0.89 in 1997). Homicide is the second most common cause of violent deaths in Russia. Moreover, the rate of increase of mortality from homicide was particularly high in the period of 1991-97, especially for females. This study was supported by the grant 98-52206 from the MacArthur Foundation.

## Introduction

This paper reviews Russian mortality from accidents and violence in the 90s. Economic experiments of the Russian government known also as a "shock therapy" started in Russia at the beginning of 1992 and were accompanied by the abolition of price controls and rapid decrease in real wages, pensions and nearly complete losses of personal savings. Shortly after 1992 Russia experienced a significant and steep rise in total mortality between 1990 and 1994 (Ellman, 1994; Gavrilova et al., 1997; Notzon et al., 1998; Leon et al., 1997; Leon, Shkolnikov, 1998; Meslé, Vallin, 1998; Shkolnikov et al., 1995a; 1995b; Walberg et al., 1998).

The purpose of this paper is to study the response of violent mortality to the Russian economic crisis. A special emphasis in this study is made on women mortality from violent causes of death. Under "violent causes of death" we consider "external causes of injury and poisoning" category classified on the basis of the external factor rather than type of injury.

## Data and Methods.

In this study we used official statistical data provided by Goskomstat (Russian/Soviet office of statistics) that include counts of deaths by cause, sex, 5-year age-group, and single calendar year of death, together with corresponding population denominators. Population data represent the Goskomstat estimates by 5-year age-groups at the beginning of the year (see Leon et al., 1997 for details on population estimation in Russia). Corresponding mid-year population was calculated on the basis of two adjacent population age distributions.

All vital events (births and deaths) in Russia are registered at a local level, and the Russian State Statistical Committee (Goskomstat) in Moscow collates the data from all 80 provinces. Data on mortality are presented in the so-called "statistical form #5". This form contains counts of death by age, sex and cause of death. The form No.5 is constructed for each of 80 Russian provinces (and for rural and urban population in each province as well). The age structure is represented by the following age groups: 0, 1, 2, 3, 4, 5-9, 10-14, ..., 80-84, 85+ (see also Meslé et al., 1995).

The system of disease classification in Russia is different from the WHO International Classification of Diseases and includes 175 categories. The last revision of Goskomstat classification was held in 1988 and the cause-of-death classification did not change since that time. Although the current Goskomstat classification is based on the 9th revision of the International Classification of Diseases, there are many differences between the International and Russian classifications (see also Meslé et al., 1995). This is particularly true for cardiovascular diseases. The classification of diseases used before 1988 is similar to the most recent one, except for the group of violent deaths and two infectious diseases (cholera and plague). Also, AIDS deaths were added to the classification after 1988. Deaths from cholera, plague, suicides, murders and injuries at working place were considered as top secret (classified) until 1988 and registered in special statistical forms (Leon et al., 1997). Thus, the usual statistical form No.5 (that was considered as less secret) did not represent deaths from the above mentioned causes before 1988. For this reason the total number of deaths from all external accidents, injuries and poisonings, was less than the total number of accidents, injuries and poisonings classified by the

type of injury (fractures, etc.). Fortunately, since 1989 the classification of causes of death was not changed, so the data for the most recent periods are completely comparable. More information on this subject could be found in a comprehensive study of comparability between Russian and International classification of diseases and causes of death (Meslé et al., 1992; 1994; 1995).

In this study we analyzed in more details the group of causes of death that combines all accidents, injuries and poisoning as well as the most important selected causes of death belonging to the "external accidents, injuries and poisoning" category: suicide and self-inflicted injury (ICD-9 codes E950-E959), homicide and injury purposely inflicted by other persons (ICD-9 codes E960-E969), accidental poisoning by alcohol, not elsewhere classified (ICD-9 code E860) and motor vehicle traffic accident involving collision with pedestrian (ICD-9 code E814). Information about suicide and homicide became available to the public after 1989. In the previous years all the information about deaths from cholera, plague, suicide, homicide, and work accidents was strictly confidential. In Russia, a large proportion of deaths due to alcohol intoxication are coded to "accidental poisoning by alcohol" (Russian code 163). In the United States most cases of alcohol related deaths are assigned to other causes (alcohol dependence syndrome, ICD-9 code 303, and nondependent use of alcohol, ICD-9 code 305.0). Only small proportion of alcohol related deaths is coded as the "accidental poisoning by alcohol" (ICD-9 code E860) (Notzon et al., 1998).

Age-standardized (age-adjusted) mortality rates were calculated using the direct method of age adjustment. The standard population chosen was the WHO "old" European standard population (see WHO, 1994). Abridged life tables were prepared using data for five-year age categories up to age 85 and over. For life table construction we used a rather simple but accurate method described by Chiang in his manual (Chiang, 1978). The tables were closed off by conventional actuarial procedures (see Chiang, 1978). The Goskomstat method approximates mortality for older age groups using the Gompertz-Makeham formula (Andreev et al., 1975), but the rate of mortality increase with age is slowing down at very high ages and is nearly leveling off after the age 100 (Gavrilov, Gavrilova, 1991). So, we estimated life expectancy for the last (open) age interval as 1/M where M is a mortality rate for the last age interval (85 years and older in our case) (Chiang, 1978). Cause-specific life tables have been prepared using multiple decrement life table method (Manton, Stallard, 1984). Two indices were calculated on the basis of the multiple decrement life tables: the chances of eventually dying and the mean expected age at death from the particular cause. Both indices do not depend on the population age structure.

## Results and Discussion.

### 1. Major Causes of Death in Russia.

The causes of death which are responsible for the majority of deaths in Russia are presented in Table 1 for years 1989 (before economic changes) and 1994 (shortly after economic changes). Table 1 shows that the diseases of circulatory system remain the major cause of death both for males and females. Mortality from injuries is the third major cause of deaths for females (after neoplasms) while for males it became the second major cause of death in 1994 (Table 1).

The causes of death which were mainly responsible for the past mortality trends in Russia are the diseases of circulatory system and injuries. The analysis of mortality trends in Russia demonstrates a considerable increase in total mortality after 1991 mostly due to increase in violent mortality (Adamets et al., 1994; Anderson, Silver, 1994; Ellman, 1994; Meslé et al., 1994; 1995; Gavrilova et al., 1997; Meslé, Vallin, 1998; Notzon et al., 1998; Leon et al., 1997) and the diseases of the circulatory system (Leon et al., 1997; Gavrilova et al., 1997; Notzon et al., 1998; Meslé, Vallin, 1998).

**Table 1. General overview of the cause-of-death structure in Russia.**
Chances per 100,000 of eventually dying for selected causes of death by sex and cause of death: Russia, 1989 and 1994.

| Cause of death | 1989 | | 1994 | |
|---|---|---|---|---|
| | Male | Female | Male | Female |
| All causes | 100,000 | 100,000 | 100,000 | 100,000 |
| Diseases of circulatory system | 51,529 | 70,740 | 44,621 | 64,574 |
| Accidents, injuries and poisoning | 12,656 | 4,400 | 22,522 | 7,148 |
| Neoplasms | 19,827 | 13,660 | 13,680 | 12,095 |
| Diseases of respiratory system | 7,086 | 4,281 | 6,684 | 3,557 |
| Diseases of digestive system | 2,698 | 2,189 | 3,029 | 2,439 |
| Signs, symptoms and ill-defined conditions | 816 | 716 | 2,972 | 5,311 |
| Infectious and parasitic diseases | 1,418 | 467 | 1,901 | 583 |
| Endocrine diseases | 363 | 705 | 422 | 1,003 |

The main feature of mortality in Russia is the high proportion of violent deaths. Mortality from accidents, injuries and poisoning determines both past and recent changes in the total mortality (Schkolnikov, 1994; Schkolnikov et al., 1995a; 1995b; Leon et al., 1997; Notzon et al., 1998) and is related in great extent to the alcohol consumption (Schkolnikov, 1994; Nemtzov, 1996; 1998; Chenet et al., 1998; Vlassov, 1999).

Even in 1990, before its dramatic increase, the Russian mortality from violence was very high. The Russian death rates exceeded US death rates in 1990 by 25% or more for suicide (ICD-9 code E950-E959), homicide (E960-E978), other injuries (E800-E807, E826-E859, E861-EE949, E980-E999), other alcohol-related causes (303, 305.0, E860) and motor vehicle crushes (E810-E825) (Notzon et al., 1998).

A more detailed structure of mortality from violent causes of death is presented in Table 2 demonstrating a significant role of social and behavioral factors in recent mortality changes. It is interesting to note that the mean expected age at death from violent causes was increasing for men and decreasing for women after year 1988. Suicide was the main cause of violent deaths both for males and for females. Its dominating position did not change after 1992 for males, but was replaced by the alcohol poisoning for females in 1994. Relatively high proportion of deaths was observed for the cause called "Injury undetermined" (Russian code 175) that corresponds to the ICD-9 "Injury undetermined whether accidentally or purposely inflicted" (ICD-9 codes 780-

799) cause of death. Wasserman and Varnik (1998) suggested that some undetermined causes of death were intentionally assigned to conceal the murder cases.

**Table 2. The structure of violent causes of death in Russia.**
Chances per 100,000 of eventually dying for selected violent causes of death by sex and cause of death in Russia before and after the "shock therapy".

| Cause of death | 1989 | | 1994 | |
|---|---|---|---|---|
| | Male | Female | Male | Female |
| Suicide | 2,945 | 888 | 4,092 | 941 |
| Accidental poisoning by alcohol | 979 | 256 | 3,274 | 1,119 |
| Injury undetermined | 1,015 | 329 | 3,081 | 968 |
| Homicide | 1,256 | 442 | 2,849 | 991 |
| Auto-transport traffic accidents (pedestrians) | 1,356 | 521 | 1,258 | 530 |
| Accidental drowning and submersion | 948 | 181 | 1,215 | 241 |
| Other accidental poisonings | 826 | 335 | 1,120 | 440 |
| Motor vehicle traffic accidents | 1,132 | 216 | 873 | 234 |
| Accidents caused by mechanical suffocation | 307 | 93 | 621 | 174 |
| Accidental falls | 472 | 330 | 576 | 258 |
| Accidents caused by fire and flames | 266 | 150 | 510 | 273 |
| Other transport accidents | 534 | 182 | 441 | 126 |

## 2. Political Experiments and Mortality Changes in Russia, 1981-1997.

The Russian mortality dynamics for the last 15 years demonstrates rather sharp changes that were followed by particular political and economic decisions made by the government (see Figure 1). In 1985 Gorbachev introduced the so-called "anti-alcohol campaign" which was close to the "dry law". This campaign, among other actions, involved governmental restrictions on supply and sale of alcohol. Immediately after these measures the life expectancy of males started to increase and reached its highest level in 1987 increasing by two years since the beginning of anti-alcohol campaign (Leon et al., 1997). Our estimates demonstrated even more considerable increase in life expectancy (by almost 3.5 years). For industrial parts of Russia this effect was even more significant. These anti-alcohol actions, however, were introduced in a rather inadequate repressive manner and caused strong social tensions that resulted in quick termination of the anti-alcohol campaign by 1990. By that time alcohol consumption and mortality rates have nearly returned to the previous levels.

In 1992 another political decision was made to start the so-called "marketing reforms" in Russia also known as a "shock therapy". In practice it was a complete abolition of the governmental control over prices in the totally monopolized economy, that resulted in enormous increase in prices and economic sufferings by the majority of population. This economic crisis seriously hit Russian population that encountered with huge losses in savings and real wages. Shortly after these economic changes the Russian mortality rates started to increase rapidly that resulted in the

fall of life expectancy up to 57.7 years for males and up to 70.8 years for females in 1994 (see Figure 1). The losses in life expectancy were 6 years for males and 3 years for females compared to year 1990 (Notzon et al., 1998). Thus, the shock effect of this "shock therapy" was achieved, while no therapy was provided.

Such dramatic changes in life expectancy raised questions about the validity of reported mortality rates. Leon et al. (1997) studied mortality in Russia during 1984-94 and came to a conclusion that these sharp changes in mortality are real and are not an artifact of poor statistics.

**3. Mortality Pattern in Russia after the "Shock Therapy".**

Figure 1 shows that the life expectancy in Russia after 1990 demonstrates two-stage dynamics. In the first stage of acute response to the stress caused by sharp changes in the life style and living standards, mortality was rapidly increasing reaching its peak in 1994. In the second stage, that could be called an "adaptation stage", the mortality was gradually decreasing although it did not reach the previous levels (see Figure 1).

Diseases of circulatory system, injuries, neoplasms and respiratory diseases are the major causes of death in Russia both for males and females. The major causes of death contributed to the mortality increase in 1990s are 1) diseases of circulatory system and 2) accidents, injuries and poisoning (Notzon et al., 1998; Mesle, Vallin, 1998; Leon et al., 1997). Figures 2 and 3 demonstrate that mortality from diseases of circulatory system and injuries responded rather acutely to the economic crisis (for both sexes), while mortality from neoplasms did not change during this period. The secular stability of mortality from neoplasms could be expected from the nature of these diseases and also indicates that the fluctuations in other causes of death are not caused by errors in population estimates (denominator problem) (Leon et al., 1997). During the health crisis, the mortality from injuries became even more important for males than mortality from neoplasms (Figure 2), while for women the injuries remained the third major cause of death (Figure 3).

The peak of mortality from injuries as well as from the diseases of circulatory system was observed in 1994. Then mortality started to decrease, although we do not have the most recent data on the effects of financial crisis in August 1998.

**4. Changes in Mortality from External Causes of Injuries and Poisoning in 1990-97.**

As it was already noted, the "external causes of injuries and poisoning" category had significantly contributed into mortality increase after the beginning of the "shock therapy" in 1992. Within this category the most important causes of death in Russia are suicide, homicide, accidental poisoning by alcohol and traffic accidents. The so-called "undetermined injuries" (Russian code 175) or "injuries undetermined whether accidentally or purposely inflicted" (ICD-9 codes E980-E989) were also important, and their role in recent mortality changes will be discussed later.

Figure 4 illustrates the mortality changes from particular violent causes of death for males in 1988-1997. The mortality from these causes started to increase very rapidly shortly after 1992

and reached its maximum values in 1994. The only exception is the mortality from the traffic accidents ("motor vehicle traffic accident involving collision with pedestrian", Russian code 161, ICD-9 code E814) which was gradually declining after 1991 (Figure 4). The most dramatic increase is observed for the mortality from accidental poisoning by alcohol, so that this cause of death became more important in 1994 than homicide and traffic accidents. Alcohol poisoning, however, demonstrates also the most rapid decrease in mortality after 1994. Mortality from homicide follows the same pattern as the mortality from alcohol poisoning implying some relation between these two causes of death. Homicide mortality demonstrates slower decline after 1994 compared to the mortality from alcohol poisoning. Suicide mortality increased dramatically after 1994 and continued to be the main cause of violent death for males in Russia. After 1994 this cause of death demonstrated slow, but steady decline in mortality (yet, we do not have the most recent data for 1998 to confirm this trend).

The mortality pattern for females after 1992 demonstrates a relatively less importance of suicide in recent mortality changes compared to males (see Figure 5). In contrast to males, suicide (the main cause of violent mortality before 1992) shows rather slow and small increase in mortality after 1992 (Fig.5) and slow decrease in mortality after 1994. As in the case of male mortality, the female mortality from alcohol poisoning manifests the most sharp and rapid increase after 1992 when mortality from this cause reaches its maximum in 1994 and overtops mortality from other violent causes. For females, the homicide became relatively more important cause of violent deaths after 1992 than for males. Again, as in the case of male mortality, the female mortality from traffic accidents gradually decreased during 1990s.

**5. The Problem of Data Quality.**

The rapid and sharp changes in mortality experienced by Russia during the last 15 years generated a reasonable concern about the quality of Russian vital statistics. This problem was discussed in previous studies (Notzon et al., 1998; Leon et al., 1997; Shkolnikov et al., 1997). The main conclusion of these studies is that the recent mortality fluctuations in Russia are not artifactual and population estimates and death counts are rather accurate to ensure the correct statistical analysis. Wasserman and Varnik (1998) conducted a study of the reliability of statistics on violent death and suicide in the republics of the former USSR. They came to a conclusion that mortality data were reliable for Russia, Ukraine and Belarus. The major concern may be addressed to the quality of cause-of-death coding (Notzon et al., 1998), since the last audit of the accuracy in reporting the causes of death was carried out in Russia in 1982 only (see Meslé, 1995). This issue is discussed here in more detail.

It seems reasonable to suggest that the main group of death causes that may indicate the quality of cause-of-death determination and coding is a group of the so-called "Signs, symptoms and ill-defined conditions" (ICD-9 codes 780-799). In Russian classification this group comprises two causes of death: "senility without mention of psychosis" and "other signs, symptoms and ill-defined conditions". Although nearly 94% of all deaths in Russia have been medically certified (Leon et al., 1997), this cause of death is not rare. Figure 6 illustrates recent changes in mortality from the "signs, symptoms and ill-defined conditions" in Russia. The mortality from this cause was rapidly increasing after 1990, particularly for males. This trajectory of mortality

supports the suggestion that the quality of vital statistics and the quality of death coding had probably declined after 1990.

A similar pattern is observed for mortality from "undetermined injuries" (Figure 6). This term can be used to conceal some cases of homicide and suicide in order to avoid criminal investigation (Wasserman, Varnik, 1998). Male mortality from this cause increased dramatically after the "shock therapy" in 1992 with maximum in 1994. We have found that in Moscow, with its relatively high proportion of unregistered migrants, homeless and refugees, the "undetermined injuries" became in 1994 very common cause of death for males exceeding all other causes of violent deaths.

Thus, while the population estimates and death counts are made with reasonably good quality, the quality of death coding is less satisfactory. This deficiency in the quality of vital statistics can bias the estimates of violent mortality in the direction of mortality underestimation. The proportion of deaths with ‘unknown age’ has been also increased. The latter fact can seriously hamper the proper calculation of life tables and other age-dependent mortality indices. The decline in data quality reflects the general degradation in health care and social welfare systems that occur now in Russia.

## 6. The Role of Alcohol Consumption in the Recent Mortality Changes.

The rise in alcohol consumption seems to be the main cause of rapid increase in mortality from violent causes of death (see Figures 4, 5). The role of alcohol was already discussed in several recent papers devoted to Russian mortality (Leon et al., 1997; Notzon et al., 1998; Leon, Shkolnikov, 1998). The most interesting is the fact of the rapid decline in mortality from alcohol poisoning after 1994 (see Figures 4, 5). A similar pattern is observed for deaths occurred in the state of alcohol intoxication (reported by Russian mortality statistics) that also demonstrates the two-stage mortality dynamics (Figure 7) with sharp peak in 1994.

There might be at least two possible explanations of the observed mortality trajectories that could be called as "adaptation hypothesis" and "selection hypothesis". According to the adaptation hypothesis, the observed changes in mortality can be a result of the increase in alcohol consumption by the total adult population after 1992 with subsequent decrease in consumption after the 1994. According to the selection hypothesis, the observed rise and fall in alcohol-related mortality may be caused by the selective elimination of rather small group of heavy alcohol addicts who could not survive in changing economic conditions. In this case the total alcohol consumption in Russia may not change significantly after 1994. Since the most recent data on alcohol consumption in Russia are not yet available to us, the choice between two hypotheses should be remained for future studies. At this time we can merely suggest that alcohol related causes of death seems to be the main force that drove violent mortality in Russia in 1990s (Notzon et al., 1998; Leon, Shkolnikov, 1998; Leon et al., 1997).

## 7. The Economic Crisis and Age-Specific Mortality from Accidents and Violence.

Detailed analysis of age-specific mortality is an important tool for understanding what age groups are the most vulnerable to economic crisis in Russia. Figures 8 and 9 illustrate changes in

age-specific mortality from injuries and poisoning for different time periods: initial period (1990), stage of dramatic increase in mortality (1994), stage of mortality decline (1997).

These pictures (Fig.8-9) show that the most vulnerable group for injuries is a group of people of pre-retirement ages (50-55 years) who demonstrated the most acute response. The retirement age in Russia is 60 years for men and 55 years for women. People of the pre-retirement ages had extremely heavy losses indeed: they lost almost all their personal savings that they tried to accumulate during their whole life and because of their age they have no hope to create new savings for forthcoming retirement. This group of people is at particular risk to lose the job and has the least chances to find a new one. This group also demonstrated the most rapid decline in violent mortality after year 1994, compared to other age groups probably because the peak level of mortality was particularly high in this pre-retirement group. No significant cohort effects are observed: the peak of mortality occurs approximately at the same age group (50-54 years) in different calendar years. Although there is some indication of slightly higher mortality for cohorts born in 1941-45, this effect is rather small. Figures 10-11 demonstrate that the major increase in mortality from alcohol poisoning occurred mainly due to mortality changes at ages 45-55.

Despite the common belief that the elderly is the most vulnerable group of population, there is no significant change in violent mortality for the age groups older than 70 years. There are no significant changes in mortality from suicide and alcohol poisoning for older age groups since 1992. Mortality from homicide among the elderly increased after 1990, but did not change significantly since 1994 (see Figures 14-15). The position of elderly people in Russia is paradoxical. Although their pensions are very small, the elderly people now often support their adult children who do not have virtually any income because of the wage arrears widely practiced by the Russian government. This support provided by the elderly may result in the increase of their social status and self-esteem, protecting them from suicides.

The mortality dynamics at younger ages (15-25 years) raises the main concern. Mortality from injuries in this age group increased after 1994 but in contrast to the middle age groups it did not decline significantly after 1994 (Figures 8, 9). Moreover, mortality from suicide and homicide (for females) remained unchanged since 1994 (Figures 12-15). Thus, in contrast to the common wisdom, the teenagers and younger adults seems to be more sensitive to Russian economic crisis compared to the elderly.

**8. Gender Differences in the Response to Economic Crisis.**

Suicide was the main cause of violent mortality both for males and females in 1990 (see Figures 3-4). The relative role of suicide in the recent rise of violent mortality was higher for males compared to females. Male suicide mortality demonstrates very rapid increase after 1992 while female mortality shows rather small change after that time (Figures 4, 5). Age-adjusted suicide mortality rate was 1.6 times higher for males and 1.2 times higher for females in 1994 compared to 1990. The different dynamics of suicide mortality for males and females may be explained by taking into account a lower explanatory value of alcohol consumption for female suicides compared with male suicides (Wasserman et al., 1998). It was estimated that the attributable fraction of alcohol consumption for female suicides in the former USSR is approximately half

less (27%) of that for male suicides (50%) (Wasserman et al., 1998). Since alcohol consumption is considered as a main driving force for mortality increase in 1990s (Leon, Shkolnikov, 1998), we could expect a larger increase in suicide mortality for males compared to females. Age-adjusted homicide mortality rate demonstrates the 2-fold increase in mortality by 1994 compared to 1990 for both sexes. The relative importance of homicide as a cause of violent death significantly increased for females after 1992: by year 1997 the homicide became as common cause of death for females as the suicide. Comparison of Figures 4 and 5 reveals that the mortality from alcohol poisoning was changing similarly for both males and females. In 1994 age-adjusted mortality from alcohol poisoning was 3.2 times higher for males and 3.8 times higher for females compared to 1990. Thus, the immediate response to economic crisis was much the same for both sexes.

The age-specific mortality from accidents and violence has bimodal age distribution of mortality for both sexes (Figures 8, 9). The ages of the first maximum (at 50-54 years) coincide for both sexes in 1994 while in 1990 and 1997 the age of first maximum for females (55-59 years) is higher compared to males (45-55 years). Mortality from alcohol poisoning demonstrates unimodal age distribution with maximum observed at higher ages for females (Figures 10, 11). Mortality from suicide has bimodal distribution for males (Figure 12) and increases monotonically with age for females (Figure 13). This pattern of age-specific suicide rates for women in Russia is similar to that in Europe (Varnik et al., 1998).

## Concluding Remarks.

The possible reasons for the mortality rise in Russia are already discussed by many investigators (Notzon et al., 1998; Leon et al., 1997; Leon, Shkolnikov, 1998). The most plausible explanations include (a) economic and social instability, (b) increase in alcohol consumption, (c) poor nutrition and (d) stress and depression (see Notzon et al., 1998). Other, less plausible, explanations include tobacco smoking, deterioration of the health care system and environmental pollution (see Notzon et al., 1998; Leon et al., 1997). Most authors come to a conclusion about the primary role of alcohol in the recent mortality changes (Notzon et al., 1998; Leon, Shkolnikov, 1998; Leon et al., 1997; Vlassov, 1999; Nemtsov, 1998).

Our results are consistent with the explanation that the alcohol abuse has the major role in the recent changes in violent mortality in Russia. However, the alcohol-related mortality turns out to be less important after 1994. Further studies of alcohol consumption in Russia may shed an additional light on the underlying causes of alcohol related mortality dynamics.

Economic and social instability is another possible reason for mortality increase that may explain the changes in suicide and homicide mortality. Males respond to the growing economic and social instability through the increase of suicide rates, while women are becoming more often the victims of homicide. Although both suicide and homicide mortality rates started to decline in almost all age groups, except teenagers and young adults, we do not have the most recent data for the effect of the 1998 financial crisis. Decrease in household real income is also an important factor contributing to the rise in mortality after 1992.

Stress and depression caused by economic crisis may be also a plausible explanation for the rise of mortality from suicides and alcohol poisoning. It should be also noted that all three possible explanations for the rise of mortality could operate simultaneously and their relative impacts remain to be determined.

Recent decline in mortality demonstrated a significant capacity of Russian people for adaptation to the changes in the life style and living standards. There were no any noticeable improvements in the living standards since 1994 when mortality started to decline. Moreover, after 1995 the Russian government started to practice the wage arrears for large groups of federal budget workers. Surprisingly, this block in salary payments (up to 12 months) did not result in catastrophic rise of mortality. The study of mortality in selected regions of Russia with different levels of personal income (Sverdlovsk province in Ural and Moscow city) revealed similar mortality dynamics over time (Figures 16-17).

The data presented here are restricted by year 1997 when the most recent statistics is available. Thus, we are not able to analyze the consequences of economic and financial crisis that happened in August 1998 in Russia. This crisis resulted in further decrease in real wages, pensions and savings of Russian people. At this time there is no information about catastrophic increase in mortality in Russia after August crisis in 1998 indicating that Russian population is probably able to cope with recent economic calamities. What we do not know is the location of the threshold for the economic sufferings that Russian people can tolerate. It is not clear how close is the Russian society to the outbreak of epidemics or massive violence triggered by some local conflict in Chechnya or elsewhere. Further studies are needed to monitor the effects of the recent economic crisis on the mortality in Russia.

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