Mortality due to External Causes of Death in the Russian Federation: Spatial Aspects and Explanatory Models

vorgelegt von Dipl.-Ärztin Elena Andreeva, MPH
zur Erlangung des akademischen Grades
Doktorin der Gesundheitswissenschaften / Public Health – Dr. P.H. –
ingereicht an der Fakultät VIII – Wirtschaft und Management
Institut für Gesundheitswissenschaften
der Technischen Universität Berlin
genehmigte Dissertation

Promotionsausschuss:

Vorsitzende: Prof. Dr. U. Maschewsky-Schneider
Berichter: Prof. Dr. M.H. Brenner
Berichter: Prof. Dr. S.P. Ermakov

Tag der wissenschaftlichen Aussprache: 20. Dezember 2005

Berlin 2006
D 83
CONTENTS

ABBREVIATIONS ..................................................................................................................... VII

EPigraph ..................................................................................................................................... VIII

ACKNOWLEDGEMENTS ........................................................................................................... IX

ABSTRACT ................................................................................................................................. - 1 -

OUTLINE OF THE PAPER ....................................................................................................... - 3 -

CHAPTER 1 – INTRODUCTION ................................................................................................. - 5 -

1.1 Violent deaths and accidents in Russia: high start, rising trends ........................................ - 6 -
1.2 Can it be an artefact due to poor quality of statistics? ......................................................... - 9 -
1.3 Who is affected? .................................................................................................................... - 11 -
   1.3.1 Gender differences ..................................................................................................... - 11 -
   1.3.2 Age distribution ........................................................................................................ - 13 -
   1.3.3 Urban versus rural? ................................................................................................... - 16 -
   1.3.4 Socioeconomic status (SES) and other factors ......................................................... - 17 -
   1.3.5 Alcohol consumption ............................................................................................... - 18 -
1.4 Socio-economic transition – is it dangerous for health? ...................................................... - 20 -
1.5 Measures of transition and acute psychosocial stress in the recent research

CHAPTER 2 – SPATIAL ASPECTS OF MORTALITY IN THE REGIONS

   OF THE RUSSIAN FEDERATION ......................................................................................... - 28 -

2.1 Introduction ........................................................................................................................ - 29 -
2.2 Data and methods ............................................................................................................... - 29 -
2.3 Results – regional patterns of mortality .............................................................................. - 30 -
   2.3.1 Suicide ...................................................................................................................... - 30 -
   2.3.2 Homicide .................................................................................................................. - 33 -
   2.3.3 Accidental poisoning by alcohol ................................................................................. - 35 -
2.4 “Good” and “bad” provinces – regional economic environment and population living

   standards ............................................................................................................................ - 37 -
   2.4.1 European high-binge-drinking zone ........................................................................ - 38 -
   2.4.2 Non-European high-homicide zone ......................................................................... - 39 -
   2.4.3 Outlier – Republic of Tuva ........................................................................................ - 40 -
   2.4.4 Other Southern Siberian provinces .......................................................................... - 40 -
   2.4.5 Ural ........................................................................................................................... - 41 -
   2.4.6 Sakhalin region ......................................................................................................... - 41 -
   2.4.7 Provinces of the European South ............................................................................. - 41 -
   2.4.8 Major cities and Murmansk region ............................................................................ - 42 -
2.5 Concluding remarks .......................................................................................................... - 45 -

CHAPTER 3 – CONCEPTUAL MODELS: (A) STRESS-RELATED MORTALITY ................ - 47 -

3.1 Introduction ........................................................................................................................ - 48 -
3.2 What causes stress? ............................................................................................................ - 48 -
   3.2.1 Transition-related stressors ..................................................................................... - 51 -
3.3 How does stress manifest? ................................................................................................. - 53 -
3.4 Successful coping versus counterproductive stress response ............................................ - 54 -
3.5 Determinants of homicide mortality .................................................................................. - 56 -
   3.5.1 Personality traits ....................................................................................................... - 56 -
   3.5.2 Mental health problems ............................................................................................ - 57 -
   3.5.3 Age and gender ......................................................................................................... - 57 -
   3.5.4 Alcohol consumption ............................................................................................... - 59 -
   3.5.5 Crime ........................................................................................................................ - 59 -
   3.5.6 Education ................................................................................................................ - 62 -
   3.5.7 Social cohesion / social support .............................................................................. - 62 -
3.6 Determinants of suicide mortality ...................................................................................... - 64 -
   3.6.1 Serious illness / mental disorders, disability and old age .......................................... - 64 -
   3.6.2 Personality traits and reactions ................................................................................ - 65 -
LIST OF FIGURES

Figure 1-1 Trends in age-adjusted mortality: diseases of the circulatory system, both sexes .................. - 6 -
Figure 1-2 Trends in age-adjusted mortality: external causes of injury and poisoning, both sexes ........ - 6 -
Figure 1-3 Changes of SDR (percent to 1989) in the Russian Federation, all ages, both sexes ............. - 7 -
Figure 1-4 Mortality structure in Russia and Sweden, percent of the total number of deaths (2001) .... - 8 -
Figure 1-5 Neoplasm mortality – Russia, Sweden and EU-15, both sexes ......................................... - 9 -
Figure 1-6 Violent and accidental mortality in Russia by cause, both sexes ....................................... - 12 -
Figure 1-7 Age distribution of male mortality due to external causes of injury and poisoning .......... - 14 -
Figure 1-8 Age distribution of female mortality due to external causes of injury and poisoning ....... - 15 -
Figure 1-9 Violent and accidental mortality in urban and rural areas of the Russian Federation, both sexes .......................................................... - 16 -

Figure 2-1 Mean annual suicide rates by groups of regions, both sexes ........................................... - 32 -
Figure 2-2 Mean annual homicide rates by groups of regions, both sexes ....................................... - 33 -
Figure 2-3 Mean annual fatal alcohol poisoning rates by groups of regions, both sexes .................. - 37 -

Figure 3-1 Age distribution of male mortality due to homicide, Russian Federation........................... - 58 -
Figure 3-2 Age distribution of female mortality due to homicide, Russian Federation ....................... - 58 -
Figure 3-3 Age distribution of male mortality due to suicide, Russian Federation ............................. - 67 -
Figure 3-4 Age distribution of female mortality due to suicide, Russian Federation ........................... - 67 -

Figure 4-1 Age distribution of male mortality due to accidental poisoning by alcohol, Russian Federation .......................................................... - 94 -
Figure 4-2 Age distribution of female mortality due to accidental poisoning by alcohol, Russian Federation .......................................................... - 94 -

Figure 5-1 Mean urban population in 77 areas of the Russian Federation ............................................. - 102 -
Figure 5-2 Mean divorce rates in 77 areas of the Russian Federation .................................................. - 103 -
Figure 5-3 Mean registered crime rates in 77 areas of the Russian Federation ..................................... - 104 -
Figure 5-4 Mean rates of graduate specialists with a university degree in 77 areas of the Russian Federation .......................................................... - 104 -
Figure 5-5 Mean abortion rates in 77 areas of the Russian Federation ................................................ - 104 -
Figure 5-6 Mean index of trade and services in 77 areas of the Russian Federation .............................. - 106 -
Figure 5-7 Mean agricultural production per capita in 77 areas of the Russian Federation ................. - 107 -
Figure 5-8 Mean volume of industrial production per capita in 77 areas of the Russian Federation ..... - 108 -
Figure 5-9 Mean Consumer Price Index for 77 areas of the Russian Federation ............................... - 109 -
Figure 5-10 Mean unemployment rates (ILO methodology) and “chances to get employed” in 77 areas of the Russian Federation ......................................................... - 110 -
Figure 5-11 Mean private savings per capita in 77 areas of the Russian Federation .............................. - 112 -
Figure 5-12 Mean number of private deposit accounts per capita in 77 areas of the Russian Federation .......................................................... - 113 -
Figure 5-13 Mean annual per capita income for 77 areas of the Russian Federation .......................... - 115 -
Figure 5-14 Mean level of accidental alcohol poisoning in 77 areas of the Russian Federation .......... - 117 -
Figure 5-15 Box and whisker graphs of means, by degree of economic activity of the regional populations (0-low, 1-high) .......................................................................................... - 131 -
Figure 5-16 Box and whisker graphs of means for Republic of Tuva and the rest of Russia’s regions (0-regions except for Tuva; 1-Republic of Tuva) ........................................ - 133 -
Figure 5-17 Mean level of accidental alcohol poisoning, by urban/rural settings in 77 areas of the Russian Federation ......................................................... - 143 -
Figure 5-18 Box and whisker graphs of means (alcohol poisonings level in different types of settings), by proportion of specified ethnic groups ........................................... - 145 -

Figure 6-1 Box and whisker graph of means: Consumer Price Index in the regions with beneficial versus severe climatic conditions .......................................................... - 169 -
Figure 6-2 Abortions per 1000 live births ......................................................................................... - 175 -

Figure 7-1 High binge drinking zone ................................................................................................ - 193 -
Figure 7-2 High suicide zone .......................................................................................................... - 194 -
Figure 7-3 High-homicide zone....................................................................................................... - 195 -
Figure 7-4 Regions with high levels of homicide, suicide and alcohol poisoning mortality ............. - 196 -
LIST OF TABLES

Table 1-1 Causes of death in the category “accidents, injuries and poisoning” according to four types of classification ................................................................. - 10 -
Table 1-2 Gender differences in violent and accidental mortality ................................................................. - 11 -
Table 1-3 Violent and accidental mortality for selected causes of death in urban and rural areas of the Russian Federation, SDR per 100,000, both sexes ................................................................. - 17 -
Table 1-4 Summary features of main long-term, short-term and hysteresis models ........................................... - 22 -

Table 2-1 Groups of regions by level and dynamics of suicide mortality rates ................................................................. - 31 -
Table 2-2 Groups of regions by level and dynamics of homicide mortality rates ................................................................. - 34 -
Table 2-3 Groups of regions by level and dynamics of alcohol poisoning mortality rates ................................................................. - 36 -
Table 2-4 List of administrative areas by economic regions ................................................................. - 43 -

Table 3-1 Core transition-related stressors ......................................................................................... - 75 -
Table 3-2 Psychosocial model of stress ......................................................................................... - 77 -

Table 4-1 Accidental poisoning by alcohol in the countries of the European Union and former Soviet block (WHO European Region) SDR per 100,000, both sexes ................................................................. - 84 -
Table 4-2 Autopsy rates in selected countries ................................................................................................. - 85 -
Table 4-3 Recorded and unrecorded (where available) alcohol consumption (in litres of pure alcohol per person per year) in 1998 for some selected countries of the WHO’s European Region ................................................................. - 87 -
Table 4-4 Prevalence of binge drinking in some selected countries ........................................................................ - 90 -
Table 4-5 Conceptual approach to the aggregate-level modelling of alcohol poisoning mortality in Russian regions: measures (or proxies) suggested ................................................................. - 98 -

Table 5-1 Definition of dependent variables ......................................................................................... - 101 -
Table 5-2 (A) Definition of independent and auxiliary variables, demographic indicators ................................................................. - 102 -
Table 5-2 (B) Definition of independent and auxiliary variables, social conditions ................................................................. - 103 -
Table 5-2 (C) Definition of independent and auxiliary variables, economic indicators ................................................................. - 105 -
Table 5-2 (D) Definition of independent and auxiliary variables, labour market situation ................................................................. - 109 -
Table 5-2 (E) Definition of independent and auxiliary variables, living conditions and welfare ................................................................. - 111 -
Table 5-2 (F) Definition of independent and auxiliary variables, climatic conditions ................................................................. - 115 -
Table 5-2 (G) Definition of independent and auxiliary variables, miscellaneous ................................................................. - 116 -
Table 5-3 (A) Sets of explanatory variables proposed for the models of stress-related mortality (suicide and homicide) ......................................................................................... - 118 -
Table 5-3 (B) Sets of explanatory variables proposed for the models of marginalisation-related mortality (accidental poisoning by alcohol) ......................................................................................... - 119 -
Table 5-4 Suicide mortality and possible explanatory variables: expected signs and associations ................................................................. - 127 -
Table 5-5 Results from panel data estimation using the GLS random effects model
   Dependent variable: suicide mortality level (sui) ......................................................................................... - 128 -
Table 5-6 Elasticities after panel data estimation using the GLS random effects model
   Dependent variable: suicide mortality (sui) ......................................................................................... - 129 -
Table 5-7 Homicide mortality and possible explanatory variables: expected signs and associations ................................................................. - 134 -
Table 5-8 Results from panel data estimation using the GLS random effects model
   Dependent variable: homicide mortality level (homi) ......................................................................................... - 135 -
Table 5-9 Elasticities after panel data estimation using the GLS random effects model
   Dependent variable: homicide mortality (homi) ......................................................................................... - 137 -
Table 5-10 Comparison of elasticities obtained for the common explanatory variables in the GLS random effects models of suicide and homicide mortality ................................................................. - 139 -
Table 5-11 Alcohol poisoning mortality and possible explanatory variables: expected signs and associations ......................................................................................... - 140 -
Table 5-12 Correlation matrix for explanatory variables ......................................................................................... - 140 -
Table 5-13 Results from panel data estimation using the GLS random effects model
   Dependent variable: accidental poisoning by alcohol, mortality level (alcp) ......................................................................................... - 141 -
Table 5-14 Results from panel data estimation using the fixed effects (within) regression model
   Dependent variable: accidental poisoning by alcohol, mortality level (alcp) ......................................................................................... - 142 -
Table 5-15 Elasticities after panel data estimation using the fixed and random effects model
   Dependent variable: accidental poisoning by alcohol, mortality level (alcp) ......................................................................................... - 142 -
Table 5-16 List of variables used in the “best fitting” model of suicide mortality ................................................................. - 146 -
Table 5-17 List of variables used in the “best fitting” model of homicide mortality ................................................................. - 146 -
Table 5-18 List of variables used in the “best fitting” models of alcohol poisonings mortality........ - 147 -
Table 5-19 Descriptive statistics for the variables used ................................................................. - 147 -

Table 6-1 Suicide and homicide – similarity in the “socioeconomic aetiology”........................... - 179 -
Table 6-2 Suicide and homicide – dissimilarity in the “socioeconomic aetiology”..................... - 180 -

Table 7-1 List of administrative areas depicted in Figures 7-1 to 7-4
(Moscow and St. Petersburg excluded).................................................................................... - 191 -

LIST OF SCHEMES

Scheme 3-1 Stress: onset and development.................................................................................. - 49 -
Scheme 3-2 Optimal coping: convergence of expectations and reality........................................ - 55 -
Scheme 3-3 Coping strategies and their consequences ............................................................... - 56 -
Scheme 3-4 Psychosocial model of transition-related stress, basic features............................. - 78 -
Scheme 4-1 Conceptual framework for the aggregate-level modelling of alcohol poisoning mortality - 97 -
ABBREVIATIONS

ACTH  adrenocorticotropic hormone
BAC  blood (ethyl) alcohol concentration
CDC  Centers for Disease Control
EU-15  the 15 Member States of the European Union prior to 1 May 2004
FAIRS  Factographic Automated Information Reference System Potential database (comprises GOSKOMSTAT data on mortality and population)
GLS  generalised least squares (method)
GOSKOMSTAT  the Federal State Statistics Service of the Russian Federation
GRP  Gross Regional Product
HFA-MDB  Supplement to WHO-HFA database (mortality indicators by 67 causes of death, age and sex)
ICD-9 / ICD-10  International Classification of Diseases, 9th or 10th Revisions
ILO  International Labour Organisation
NIS  Newly Independent States (former republics of the Soviet Union)
OECD  Organisation for Economic Co-operation and Development
OLS  ordinary least squares (method)
OR  Odds Ratio
SBERBANK  the Savings Bank of the Russian Federation
SDR  standardised (age-adjusted) death rate
SES  socioeconomic status
WARC  World Advertising Research Center
WHO  World Health Organization
WHO-HFA  World Health Organization, Regional Office for Europe, European health for all database
“Was it on the highway that you gave up your spirit, or did your friends finished you because of some fat, ruddy soldier’s wife ... Or, perhaps, you thought things over, lying on your pallet, until – without rhyme or reason – you dropped into a tavern, and then fell into an ice-hole and vanished? Oh, these Russian people! They dislike dying a natural death!”

Nikolai Gogol' (1842). Dead Souls, Chapter VII
ACKNOWLEDGEMENTS

My initiation in stress research took place when I started my clinical work at mental hospital in St. Petersburg. The current investigation would have probably took another line, if I would not have met Prof. Nuller (deceased) and his colleagues at Bekhterev research institute of neurology and psychiatry.

Later I got the opportunity to explore the fascinating subject of stress from the state point of its impact on populations’ health. This study has been initiated in the framework of the research project “Impact of the economic transition on health in Eastern European countries and Russia”, which has been carried out with a financial support from the International Bureau of the Federal Ministry on Education and Research, German Aerospace Centre (DLR).

This dissertation would not have been possible without the unflinching support of Prof. M Harvey Brenner. His empirical research on impact of economic conditions on populations’ health piqued my interest to these issues. I thank Prof. Brenner for trust, opportunity and guidance. Numerous discussions with him encouraged me to formulate my arguments clearly and coherently and to improve my writing skills.

My sincere thanks go to Prof. Sergei Petrovich Ermakov. The inspirational sessions with Prof. Ermakov, his constructive comments, useful literature and software recommendations, as well as detailed data on population and cause-specific mortality (FAIRS) contributed essentials.

I would like to express my heartfelt gratitude to Dr. Günter Edenharter – for his enthusiasm and willingness to share his experience in econometric modelling. Günter was the first to point out to me the potential of panel data models.

I was fortunate to have excellent, capable and conscientious colleagues, both in Berlin and in St. Petersburg. In order of appearance, I thank Dr. Sofia Boldyreva, Sigrid Marquardt, Stephan Ha- man, Monika Knaden, Maja Rotter, Carmen Seckel, Rober Farkov, Irina Afanassieva and Axel Schmidt for their intellectual, emotional, technical and logistical support at various stages of this work.

I am grateful to my students in Public Health course at the Berlin University of Technology, for their thoughtful questions and a sincere interest to my favourite research field.

This study was like an exciting trip – very dynamic and full of discoveries. But I would have never managed it without your love and care, my dear husband. Your constant support and encouragement gave me an inspiration and helped me immensely to concentrate on this study. My love and thanks to you, Dimm, and to my parents.

Berlin
November 22, 2005
ABSTRACT

Background
During the socio-economic transition there was an epidemic increase of violent and accidental mortality in the Russian Federation, which led to changes in the country's mortality structure. At present, external causes of death occupy the second place in the mortality rank of the total Russian population. There are two main hypotheses in the literature, suggesting an explanation of violent mortality epidemics in Russia:

- transition itself may play the role of a “killer” (via stress or impoverishment); or
- a high level of alcohol consumption is the most important underlying factor.

Due to considerable difficulties in the identification of valid measurements of alcohol consumption or transition-related stress, the “epidemic outbreak” of violent mortality remains largely unexplained. Many terms are used loosely and interchangeably, including transition and stress. Various ecological studies have widely employed alcohol poisoning mortality as a proxy measure of heavy binge drinking or even alcohol consumption. However, there were no attempts to explore aggregate-level determinants of this cause of death.

Aims and objectives
This study focused on three important causes of violent and accidental mortality – suicide, homicide and accidental poisoning by alcohol. The overarching research aim was to clarify their macro-level “aetiology” in the regions of transitional Russia. In support of this aim, four main objectives were formulated:

(1) scrutiny of regional characteristics – with respect to economic structure and performance, population living standards, climatic conditions etc – which are typical for high- and low-mortality provinces;
(2) development of uniform conceptual frameworks for studying the determinants of violent and alcohol-related mortality;
(3) identification of appropriate proxy measures which can be used to represent the particular concepts in transitional Russia, and
(4) testing the conceptual frameworks with regional panel data.

Research methods and approaches
The suggested research study combined a variety of approaches. The descriptive approach revealed enormous variations in the spatial distribution of violent and alcohol-related mortality rates. We identified clusters of high- and low-mortality regions which have been found to possess common characteristics of the population living standards, economic structure and performance, climatic conditions etc. This regional diversity is deeply rooted in the country’s history; it is not a total-lot product of the socioeconomic transition.

We suggested some basic pathways through which the regional environment may affect selected causes of death. This has been done in order to address the specific challenges of time loosely termed as a socioeconomic transition. This conceptual approach included the elaboration of the psychosocial stress model and the model of marginalisation-related mortality among “never-do-well alcoholics”.

Finally, the theoretical models of stress- and marginalisation-related mortality have been tested with a pooled cross-sectional time series analysis of regional panel data. This analytical approach enabled us to explore the specific “socioeconomic aetiology” of suicide, homicide and alcohol poisoning mortality in Russia. We used annual data (1990-2001) on cause-specific mortality and
its explanatory variables – mostly derived from official statistical sources – for 77 administrative areas of the Russian Federation.

**Main findings**

Suicide and homicide demonstrated a remarkable similarity in their socioeconomic aetiology. Age-adjusted mortality rates for these violent stress-induced causes of death were significantly associated with some common measures of the:

- “core transition-related stressors” (losses of private savings, hyperinflation etc) and
- “insane social environment” (heavy binge drinking, social tension/disruption).

In addition, the same coping strategies have been found to significantly reduce the regional levels of stress-related mortality – namely, complementary economic activities of the population.

There were, however, some important differences in the “best fitting” models of these stress-related causes of death. They may indicate the presence of specific behavioural patterns, crucial for the manifestation of non-premeditated homicide or non-impulsive suicide in definite stages of stress. This hypothesis rests on Selye’s concept of phase-wise stress reactions, including Alarm, Resistance and Exhaustion.

Higher susceptibility of homicide rates to acute unanticipated stressors, their affinity to risks linked with both shadow and legal economic activities (“wild capitalism” markers) confirmed the hypothesis of homicide manifestation in the Alarm stage of stress. Further, homicide rates were sensitive to a lower access to educational resources, as well as to the challenge of higher living and production costs in climatically disadvantaged areas.

Lacking economic activity turned out to be the strongest predictor of suicide mortality. Deficiency of coping resources and behavioural patterns of “escape” are crucial for the last stage of stress – Exhaustion, in which non-impulsive suicide is assumed to manifest. In addition, suicide rates were explained by the factors related to severe economic depression (drastic decline in manufacturing production and low chances to get employed), “rural effects” (measured by the volume of agricultural production per capita) and the proxy-measure of lacking social cohesion/support.

As for the fatal accidental poisonings by alcohol, this study is the first empirical paper on their determinants in the regions of Russia. Our aggregate-level results point out to a significant role of hazardous drinking habits, which have been examined by urban/rural settings, access to educational resources and ethnic composition of the regional populations.

To a substantial part, alcohol poisonings rates also depend on the extent of marginalisation-related processes. The latter include two groups of factors: (1) those characterising rapid unfavourable changes in the regional economic environment – measured, for instance, by the financial losses of the population, as well as by the proxy of the economic restructuring and its “side effects” – and (2) those related to anomie, alienation and social isolation – expressed by the rates of divorces, abortions, crime and unemployment.

To approximate heavy binge drinking, we used alcohol poisoning mortality as an explanatory variable in the models of suicide and homicide rates. It was a significant, but not the leading predictor of stress-related mortality. We conclude, therefore, that heavy binge drinking should not be regarded as the crucial determinant of mortality in Russia.

**Key words:**
OUTLINE OF THE PAPER

The introductory chapter gives an overview of literature and official statistical data with respect to levels and trends of external causes of death, issues of statistical data quality, identification of high risk groups by gender, age, urban-rural differences, socio-economic status etc. Further, the issues of alcohol consumption are reviewed. Special attention is paid to the hypotheses about the key role of the socio-economic transition and transition-related stress, as well as measurements of these constructs, which are suggested in the recent literature.

The second chapter examines the spatial distribution of violent and accidental mortality in the regions of the Russian Federation. The brief introductory part is followed by the discussion of data and methods used to identify zones of high- and low-mortality. The subsequent presentation of results includes a detailed description of these zones – separately for suicides, homicides and fatal alcohol poisonings. Further, we synthesise the regional typology of mortality patterns with the evidence from studies in regional economics: “good” and “bad” provinces are characterised by the living standards of the population, economic structure and performance, labour market situation, climatic conditions and other parameters of regional environment, which may determine the regional patterns of mortality. Some concluding remarks close this chapter.

Chapter 3 presents a conceptual model of stress-related mortality. We begin with the formulation of main research questions and objectives. From a psychological standpoint, we look at general causes of stress. Further, specific stressors are identified, typical for Russia in transition. Then we discuss the whole sequence of stress reactions, psychological symptoms and behavioural patterns, as well as the issues of successful versus counterproductive stress responses. A large space is devoted to the review of “classical determinants” of homicide and suicide mortality, which are closely linked with stress vulnerability and coping resources of individual and populations. The concluding part presents a conceptual multilevel framework for analysing the impact of stress on suicide and homicide mortality.

Chapter 4 continues the elaboration of conceptual frameworks – particularly, for fatal alcohol poisonings. After a short introduction, we discuss the basic approaches to measuring alcohol-related harm, alcohol consumption and patterns of drinking. An examination of forensic aspects, diagnostic and coding practices – and the discussion of survey-based “binge drinking prevalence” – enables some conclusions to be made about validity, reliability and the actual meaning of “hard” and “soft” statistical data for the Russian Federation. We review the determinants of alcohol poisoning mortality and, finally, offer a conceptual summary with a framework for the aggregate-level modelling of mortality in marginalised never-do-well alcoholics.

In Chapter 5, we test our theoretical conceptual models with a pooled cross-sectional time series analysis of regional panel data. Main research hypotheses are outlined in the introductory part, which is followed by a detailed description of variables and data transformations. Further, we discuss statistical methods and present analytical results – separately for suicide, homicide and alcohol poisoning mortality. Technical appendix provides lists of variables used in the “best fitting” models and the descriptive statistics of variables.

The discussion of findings is given in Chapter 6. We begin with the argumentation for the aggregate-level approach to analysing unnatural causes of death. This is followed by a debate about material deprivation and mortality, limitations of commonly used measures in the Russian regional context, arguments for the indicators selected in the given study etc. A considerable space is devoted to the clarification of the “socioeconomic aetiology” of suicide, homicide and accidental poisoning by alcohol. Concluding remarks summarise these discussions.

Chapter 7 presents conclusions drawn from our findings; it suggests some ideas for the future research in this field and outlines the direction of possible prevention policies on violent and acci-
dental mortality in the regions of Russia. Here, we discuss in brief generalisability of inferences, the issues of regional diversity, strategies to reduce mortality, as well as novelty of findings and approaches.

In Annex, we provide a cartographic visualisation of cause-specific death rates in the regions of the Russian Federation. The maps are given in a chronological sequence for the period 1990-2000 – for suicide, homicide and alcohol poisoning mortality. In order to visualise better the mortality dynamics, the SDRs are aggregated in rigid classes for each cause of death. The dark green colour corresponds with the lowest mortality rates, whereas the red colour marks the highest SDRs.
CHAPTER 1 – INTRODUCTION
1.1 Violent deaths and accidents in Russia: high start, rising trends

The issue of mortality crisis in the former socialist countries of Europe is well described in the epidemiologic literature (Cornia & Paniccià 2000 p3-37). The gradual deterioration of life expectancy of the 1970s and 1980s was followed by its sharp fluctuations in the 1990s, which reached especially dramatic magnitude in the Russian Federation. These fluctuations are not yet stabilised, and the mortality remains at a higher than pre-transition level.

**Figure 1-1** Trends in age-adjusted mortality: diseases of the circulatory system, both sexes

**Figure 1-2** Trends in age-adjusted mortality: external causes of injury and poisoning, both sexes

*Data source for Figures 1-1 & 1-2: WHO-HFA (state: June 2005)*
The radical decline of life expectancy in Russia was mostly attributed to increased cardiovascular and violent mortality. Notzon and co-authors (1998) estimated that the upsurge in cardiovascular mortality accounted alone for 36% of the decline in life expectancy between 1990 and 1994, while rising mortality due to violent and accidental deaths accounted for 29% of the life expectancy decline (respectively, 65% for both causes-of-death categories together). The trends of these causes of death are in contrary to those in the industrialised countries (Figures 1-1 & 1-2).

According to Lock et al (2002), if male and female mortality from accidental and violent deaths would have been reduced by 20% of the current level (calculated for 1995-1999), the gain in the life expectancy would have reached 0.58 years for both sexes. The same level of cardiovascular mortality reduction would have provided 0.40 years increase in life expectancy for both sexes.

In comparison with the industrialised countries Russia demonstrated higher level of mortality due to external causes since 1970s. In 1980 the SDR for suicide was about the same as in Hungary (i.e. one of the highest world-wide), while the homicide rate was higher than in the USA (the highest among the industrialised countries). The rate for accidental drowning exceeded 7-10 times the level of an average developed country (Meslé et al 1996).

At the beginning of 1980s a clear downward trend of external causes of mortality has been observed. Partly it coincided in time with the anti-alcohol campaign, launched by the Soviet government in 1985.

Since 1988 a new increase of external causes has been registered, rather smooth until 1991 and remarkably steep afterwards. Thus, during the period of the socio-economic transition, the Russian population experiences a real epidemics of external death causes: in comparison with the other most important “killers” (circulatory system diseases, neoplasms), this particular cause-of-death category demonstrates the biggest increase across time (Figure 1-3), resulting in a peak in 1994 – the most pronounced for the whole observation period, for which the continuous external mortality data are available.

**Figure 1-3 Changes of SDR (percent to 1989) in the Russian Federation, all ages, both sexes**

![Figure 1-3](image-url)

*Data source: WHO-HFA (state: June 2005)*
INTRODUCTION

After 1994, the mortality rates for external causes started to drop until 1998, but did not reach the “pre-transition” level. The favourable trend reversed again and was followed by the new increase of violent and accidental mortality. Nowadays, the homicide mortality level in Russia is nearly fifty times higher than in an average Western country, and about five times larger than in the USA (Shkolnikov & Cornia 2000 p262), despite significantly much more negative attitude towards violence and killing among Russian survey respondents than among Americans (McAlister et al 2001). As for suicide, only Lithuania reports currently higher age-adjusted mortality than the Russian Federation (WHO-HFA 2005).

The sharp increase of death rates due external causes led to changes in Russia’s mortality structure: leaving behind both cancers and non-malignant neoplasms together, external causes occupy the second place in the mortality scale of the total Russian population persistently at least since 1993. In the Western industrialised countries – for instance, in Sweden – this cause-of-death category is inferior to cancers (Figure 1-4). Nevertheless, the situation of Russia is not unique: violent and accidental deaths prevailed over cancers in Latvia and Estonia in 1994. Indeed, in the former Soviet Union countries, where the external mortality has also epidemically risen during the socio-economic transition (e.g., Lithuania, Ukraine, Belarus and Kazakhstan), a convergence between the age-adjusted mortality rates for cancers and external causes can be observed.

![Figure 1-4 Mortality structure in Russia and Sweden, percent of the total number of deaths (2001)](image)

*Source: Author’s calculations based on WHO-HFA data (state: June 2005)*

The smaller proportion of neoplasms in Russia (Figure 1-4) does not indicate lower age-adjusted mortality rates for this cause-of-death category. The current level of neoplasm mortality in Russia is higher than in Sweden, it slightly exceeds the average level of the old Member States of the European Union (Figure 1-5).

In conclusion, the available data show that external causes of death play a significant role in the mortality crisis witnessed recently in Russia. At present, the level of violent and accidental mortality in Russia is the highest in European region of the World Health Organisation (WHO-HFA 2005). None of the industrialised countries have at least comparable figures for this cause-of-death category.
1.2 Can it be an artefact due to poor quality of statistics?

Researches who examined this issue (Notzon et al 1998; Leon et al 1997; Andreev 1999 p262-283) conclude that the problems of data quality or reporting procedures are unlikely to explain the dramatic upsurge in mortality.

Since 1980s, 94-98 percent of all deaths in Russia are thought to have been medically certified, the rest being certified by trained paramedical staff (feldshers). Reporting procedures, population estimates and death counts across the country are believed to be accurate enough to guarantee correct mortality estimates – probably, except for some regions, such as the North Caucasus Republics and the Republic of Tuva (Andreev 1999).

Indeed, some distortions can arise due to the cause-of-death coding. The information on suicides and homicides was treated as a secret until the late 1980s. For the first time these violent causes entered the GOSKOMSTAT classification as entities in 1988. However, rather than removing these deaths from mortality reports, GOSKOMSTAT included them in the “cause not specified” category (Notzon et al 1998). In any case, within the major category of external causes they were not accounted until 1988.

The cause of “injuries undetermined whether accidentally or purposely inflicted” (undetermined injuries) are supposed to be the most problematic within the category of violent and accidental deaths (Gavrilova et al 2000). In Moscow with its high proportion of unregistered migrants, homeless and refugees, mortality due to undetermined injuries was found to exceed any other cause of violent mortality in 1994. This finding lets suspect that suicides and homicides could be miscoded to avoid criminal investigations.

Despite the possible miscoding, the state statistics on violent mortality is recognised to be reliable for Russia, as well as for Ukraine, Belarus and the post-Soviet Baltic countries (Wasserman & Värnik 1998).
### Table 1-1 Causes of death in the category “accidents, injuries and poisoning” according to four types of classification

<table>
<thead>
<tr>
<th>Causes of death</th>
<th>GOSKOMSTAT codes</th>
<th>ICD-9 code</th>
<th>ICD-10 code</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1989-1998</td>
<td>since 1999</td>
<td></td>
</tr>
<tr>
<td>motor vehicle accidents involving occupants of the vehicle</td>
<td>160,162</td>
<td>240</td>
<td>E810.0-E813.9, E815.0-E829.9</td>
</tr>
<tr>
<td>motor vehicle traffic accidents involving collision with pedestrians</td>
<td>161</td>
<td>239</td>
<td>E814.0-E814.9</td>
</tr>
<tr>
<td>other transport accidents</td>
<td>162,160</td>
<td>241</td>
<td>E800.0-E807.9, E830.0-E848.9</td>
</tr>
<tr>
<td>accidental poisoning by alcohol</td>
<td>163</td>
<td>247</td>
<td>E860.0-E860.9</td>
</tr>
<tr>
<td>accidental poisoning by other substances, gases and vapours</td>
<td>164</td>
<td>248</td>
<td>E850.0-E858.9, E8610-E8699</td>
</tr>
<tr>
<td>complications of surgical and medical procedures</td>
<td>165</td>
<td>253</td>
<td>E870.0-E876.9, E878.0-E879.9</td>
</tr>
<tr>
<td>accidental falls</td>
<td>166</td>
<td>242</td>
<td>E880.0-E888.9</td>
</tr>
<tr>
<td>accidents caused by fire and flames</td>
<td>167</td>
<td>246</td>
<td>E890.0-E899.9</td>
</tr>
<tr>
<td>accidental drowning and submersion</td>
<td>168</td>
<td>243</td>
<td>E910.0-E910.9</td>
</tr>
<tr>
<td>accidental mechanical suffocation</td>
<td>169</td>
<td>244</td>
<td>E911.0-E915.9</td>
</tr>
<tr>
<td>accidents caused by firearm missile</td>
<td>170</td>
<td>252</td>
<td>E922</td>
</tr>
<tr>
<td>accident caused by electric current</td>
<td>171</td>
<td>245</td>
<td>E925.0-E925.9</td>
</tr>
<tr>
<td>all other accidents</td>
<td>172</td>
<td>254</td>
<td>E900.0-E909.4, E916.0-E921.9, E923.9-E924.9, E926.0-E949.9, E970.0-E978.9</td>
</tr>
<tr>
<td>suicide and self-inflicted injury</td>
<td>173</td>
<td>249</td>
<td>E950.0-E959.9</td>
</tr>
<tr>
<td>homicide and injury purposely inflicted by other person</td>
<td>174</td>
<td>250</td>
<td>E960.0-E969.9</td>
</tr>
<tr>
<td>injury undetermined whether accidentally or purposely inflicted</td>
<td>175</td>
<td>251</td>
<td>E980.0-E989.9</td>
</tr>
<tr>
<td>Injuries due to operations of war</td>
<td>172</td>
<td>252</td>
<td>E990.0-E999.9</td>
</tr>
<tr>
<td>All other accidental injuries</td>
<td>172</td>
<td>254</td>
<td>E900.0-E909.9, E916.0-E921.9, E923.0-E924.9, E926.0-E949.9, E970.0-E978.9</td>
</tr>
</tbody>
</table>

In Russia, the uniformity of coding standards ensures a good comparability of the cause-specific mortality across regions. The major category of external death causes underwent no considerable

---

1 replaced by „all other accidental injuries” and „injuries due to operations of war” in 1999
2 introduced in 1999
3 introduced in 1999
changes since 1989, although a new GOSKOMSTAT classification, based on ICD-10, replaced the previous one in 1999. In general, this classification introduced the finer breakdown by causes of death within the category (Table 1-1), separating “injuries due to operations of war” from “all other accidents”. Nevertheless, the overall category remains comparable across time since 1989. The same is true for its major components, like suicides, homicides and accidental alcohol poisonings.

1.3 Who is affected?

1.3.1 Gender differences

The radical increase in the premature male mortality – first of all, due to the circulatory system diseases and external causes of death – resulted in the enormously widening gap between male and female life expectancy: between 1958/59 and 1995 it grew from 7.3 to 13.5 years (Shkolnikov & Cornia 2000).

The male SDRs for violent and accidental mortality in the Russian Federation exceed more than fourfold the corresponding figures for females. These gender mortality differences have considerably reduced in 1985-1988. Nevertheless, even in this period, they were much higher than in the European Union (Table 1-2).

<table>
<thead>
<tr>
<th>YEAR</th>
<th>Russia</th>
<th>EU-15</th>
<th>Italy</th>
<th>Sweden</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>4.1</td>
<td>2.2</td>
<td>2.3</td>
<td>2.2</td>
</tr>
<tr>
<td>1981</td>
<td>4.2</td>
<td>2.3</td>
<td>2.4</td>
<td>2.4</td>
</tr>
<tr>
<td>1982</td>
<td>4.1</td>
<td>2.3</td>
<td>2.4</td>
<td>2.4</td>
</tr>
<tr>
<td>1983</td>
<td>4.1</td>
<td>2.2</td>
<td>2.4</td>
<td>2.5</td>
</tr>
<tr>
<td>1984</td>
<td>4</td>
<td>2.3</td>
<td>2.4</td>
<td>2.5</td>
</tr>
<tr>
<td>1985</td>
<td>3.7</td>
<td>2.3</td>
<td>2.3</td>
<td>2.3</td>
</tr>
<tr>
<td>1986</td>
<td>3.6</td>
<td>2.3</td>
<td>2.3</td>
<td>2.5</td>
</tr>
<tr>
<td>1987</td>
<td>3.7</td>
<td>2.3</td>
<td>2.3</td>
<td>2.4</td>
</tr>
<tr>
<td>1988</td>
<td>3.8</td>
<td>2.4</td>
<td>2.3</td>
<td>2.3</td>
</tr>
<tr>
<td>1989</td>
<td>4</td>
<td>2.4</td>
<td>2.5</td>
<td>2.4</td>
</tr>
<tr>
<td>1990</td>
<td>4.1</td>
<td>2.4</td>
<td>2.4</td>
<td>2.3</td>
</tr>
<tr>
<td>1991</td>
<td>4.3</td>
<td>2.5</td>
<td>2.5</td>
<td>2.3</td>
</tr>
<tr>
<td>1992</td>
<td>4.4</td>
<td>2.5</td>
<td>2.5</td>
<td>2.3</td>
</tr>
<tr>
<td>1993</td>
<td>4.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.3</td>
</tr>
<tr>
<td>1994</td>
<td>4.5</td>
<td>2.6</td>
<td>2.5</td>
<td>2.1</td>
</tr>
<tr>
<td>1995</td>
<td>4.5</td>
<td>2.5</td>
<td>2.4</td>
<td>2.4</td>
</tr>
<tr>
<td>1996</td>
<td>4.4</td>
<td>2.5</td>
<td>2.3</td>
<td>2.3</td>
</tr>
<tr>
<td>1997</td>
<td>4.2</td>
<td>2.6</td>
<td>2.4</td>
<td>2.5</td>
</tr>
<tr>
<td>1998</td>
<td>4.2</td>
<td>2.6</td>
<td>2.6</td>
<td>2.4</td>
</tr>
<tr>
<td>1999</td>
<td>4.3</td>
<td>2.5</td>
<td>2.5</td>
<td>2.3</td>
</tr>
<tr>
<td>2000</td>
<td>4.4</td>
<td>2.6</td>
<td>2.5</td>
<td>2.5</td>
</tr>
<tr>
<td>2001</td>
<td>4.4</td>
<td>2.6</td>
<td>2.5</td>
<td>2.5</td>
</tr>
<tr>
<td>2002</td>
<td>4.4</td>
<td>2.6</td>
<td>2.6</td>
<td>2.6</td>
</tr>
</tbody>
</table>

Source: Author’s calculations – SDR male-to-female ratios – based on WHO-HFA data (state: June 2005)

Suicide remained the leading cause of violent and accidental mortality for the total Russian population, before and during the socio-economic transition (Figure 1-6). This phenomenon is caused by the extremely high level of male suicide, while its role in women is less substantial.
Here are some estimates based on WHO-HFA data (state: June 2005). From 1989 to 1994, male suicide mortality increased by 67.5%, while this increase in females was 22.3%. During the period of recovery – up to 1998 – males demonstrated more considerable fall of suicide rates in comparison to females: 19.8% and 16.8% respectively. Finally, the following deterioration of suicide mortality was much more manifest in men than in women: 11.3% and 0.3% respectively, as indicated by the difference between the age-adjusted death rates in 1998 and 2001.

Figure 1-6 Violent and accidental mortality in Russia by cause, both sexes

Data source: GOSKOMSTAT / FAIRS (state: 2002)
INTRODUCTION

Most commentators agree that alcohol plays a significant role in increasing suicide mortality. The nature of these relations remains, however, unclear. There were attempts to explain gender differences in suicide mortality by the lower contribution of alcohol consumption to female suicides. For the former USSR, Wasserman and colleagues (1998) estimated that the attributable fraction of alcohol consumption in male suicides (50%) exceeds nearly twice that in females (27%).

However, even if the relationships between the level of alcohol consumption and suicide mortality are strong and perfectly significant in the examined populations, this epidemiologic evidence by itself is insufficient to establish causality. Thus, alcohol consumption may not necessarily act as a direct causal factor for the suicide mortality. Increased alcohol consumption and suicide mortality might represent two different outcomes of some common risk factors – like material deprivation, rapid unanticipated socioeconomic changes etc. Men can be more vulnerable to these changes.

Gavrilova and co-authors (2000) suggest an explanation of the weaker response of female suicide to the economic crisis by a protective role of women's family responsibilities (taking care for children and old parents). However, this protective role fails to explain the dynamics in female fatal alcohol poisoning (FAIRS 2002):

- 1989–1994: surge of SDR by 352.8% (the respective figure for men – 287.5);
- 1994–1998: SDR falls by 55.2% (in males – 52.7%)
- 1998–2001: new increase by 64.4% (in males – 55.3%).

In 1994, at the peak point of Russian mortality, alcohol poisonings become the leading external cause of death in women. The level and dynamics of this particular mortality cause can probably serve as a marker of transition-related changes in the traditional life style of the Russian female population, resulting in deviant behaviour. On the other hand, it can testify to a “selection” of the most vulnerable groups, incapable to psychologically adapt to the rapidly changing socio-economic conditions. Fatal heavy drinking of low-quality alcohol and toxic surrogates is usually ascribed to marginal population strata.

1.3.2 Age distribution

In all age groups, violent and accidental deaths occupy the second place in the mortality scale for men (since 1993) and the third place in women.

Examining the age distribution of violent and accidental mortality during the time of the socio-economic transition, intriguing patterns can be identified.

In males, the following changes were observed:

1. Before the beginning of the “shock-therapy” of 1992, the highest age-specific mortality rates have been recorded in the oldest male age group (80 years and above). It would have coincided with the common belief that elderly are the most vulnerable part of the population, if mortality in the age groups 60-69 and 70-79 would have followed the same pattern. However, it is even lower than mortality in men aged 30-39 years. In 1989-1991, the shape of the age distribution of mortality resembles an arched cat's back, with the prominent part for the age groups 40-49, 50-59 and 30-39.

2. Immediately after the onset of the major economic reforms (1992), the death rates of working age men (50-59, 40-49, 30-39) swiftly outstripped mortality rates in those aged 80 and above. During 1992-1994 an increase of violent and accidental deaths occurred in all male age groups, but it was the lowest in the population groups which are believed to be the most vulnerable – i.e. elderly, children and teenager.

3. The later fluctuations of violent and accidental mortality did not change significantly the shape of the age distribution: the highest mortality rates are continued to be observed in
middle-aged men (50-59 and 40-49), followed by the two neighbouring age groups (30-39 and 60-69).


5. Children and teenager show relatively stable and low violent mortality rates across time.

6. In the oldest male group there is a continuous decrease of mortality after 1994, while other age groups experience a new increase since 1999. Moreover, in the year 2001 the most senior men demonstrate even lower mortality level than in 1989.

The described patterns of male age-specific mortality are graphically illustrated by Figure 1-7 for some selected years.

**Figure 1-7** Age distribution of male mortality due to external causes of injury and poisoning

![Age distribution of male mortality](image)

*Data source:* GOSKOMSTAT / FAIRS (state: 2002)

A similar dynamics – although not in the same magnitude – can be observed in the female age groups:

1. Over 1989-1991, the age distribution of violent mortality in women seems to reflect the classical pattern: the highest death rates are observed in the oldest group, they decline gradually towards the younger ages.

2. After the onset of the “shock therapy” there was a jerky raise of violent mortality in all female age groups, except for children, teenager and elderly aged 80 and above. The most considerable mortality increase has been observed in middle-aged women (50-59 and 40-49), forming the picture of an arched cat’s back over the period 1992-1994.

3. During the recovery time – up to 1998 – the decrease of age-specific death rates did not result in the restoration of the initial shape of the female mortality distribution – first of all, due to high mortality in women aged 50-59.
INTRODUCTION

4. For the young women (20-29) there was no improvement in violent mortality to 1998. They show the same pattern of mortality dynamics as men in the same age: higher death rates to the end of the observed period.

5. The fluctuations of mortality in the oldest female age group are not as significant as in the younger ages. Like in men in the same ages, there is a downward trend of mortality with the lowest death rates observed in 2000-2001.

6. The level of violent and accidental mortality in female children and teenager remains low and stable compared to other age groups.

Figure 1-8 shows the age distribution patterns discussed above for female mortality.

![Figure 1-8 Age distribution of female mortality due to external causes of injury and poisoning](image)

Data source: GOSKOMSTAT / FAIRS (state: 2002)

Thus, both in males and females, the youngest and the oldest ages were found to be not affected by the violent mortality increase during the time of the socio-economic transition.

In contrary, since 1992, violent and accidental mortality is the first important cause of death in working ages, both in men and in women.⁴

The highest level of death rates due to injuries and poisonings has been observed in the people of middle – especially, pre-retirement – ages.⁵

These findings can not be fully explained by the cohort effects. Other arguments with respect to age-specific psychological risks/difficulties/advantages (Gavrilova et al 2000), seem to be more plausible: higher risk of unemployment, lost of almost all personal savings and social prestige by the people in pre-retirement ages can explain the response of this particular age group to economic crisis, but is hard to generalise to the other age groups affected. In order to find an explanation for better coping in elderly people, Gavrilova et al discuss their paradoxical position. De-

⁴ estimated for the broader age groups: 20-59 for men and 20-54 for women

⁵ The retirement age in Russia is 60 years for men and 55 years for women.
Despite their pensions are very small, they provide financial support to their adult children, who have no income due to unemployment or arrears in wages. This support improves the social status and self-esteem of the elderly, protecting them from suicides or heavy drinking. As these considerations are equally correct for all Russian pensioners, one should expect an equally high (or equally low) response of all population groups aged 60 and above. This hypothesis, however, is not supported by the evidence.

### 1.3.3 Urban versus rural?

The overall mortality has been traditionally higher in rural settlements of Russia (Shkolnikov & Cornia 2000). It is also true for the violent and accidental causes (Figure 1-9). This phenomenon is usually explained by the higher maladjustment degree of the rural population, massive migration in the cities, heavy binge drinking in rural areas and underemployment of the rural population (Bogoyavlenskiy 2000 p86-99).

![Figure 1-9 Violent and accidental mortality in urban and rural areas of the Russian Federation, both sexes](image)

**Data source:** GOSKOMSTAT / FAIRS (state: 2002)

Over 1989-1995, the rural surplus in violent mortality reduced from 1.4 to 1.1 – due to a faster increase in the urban death rates. For both men and women, the age-adjusted mortality rates for the major category of external causes jumped to 1994 by 101.6% in the cities and towns, while this increase in the rural areas was amount to 64.81%. In the following years, urban violent mortality shows again more pronounced fluctuations.

A striking rise of accidental and violent deaths in the metropolitan areas of Moscow and St. Petersburg drew a rapt research attention, as these regions suffered some of the largest deteriorations over 1989-1994. Shkolnikov & Cornia (2000) hypothesised this phenomenon to be attributed to escalating violent mortality among unregistered migrants, whose numbers doubtless increased during the transition period.
INTRODUCTION

Other urban-rural peculiarities refer to distribution of particular violent death causes (Table 1-3.):

- Urban areas demonstrate significantly higher mortality level due to undetermined injuries. Indirectly, it may reflect considerable differences in crime level, if we will assume that many homicide cases may be coded as undetermined injuries in order to avoid criminal investigations.

- A direct confirmation of higher urban crime level would have been an excess in homicide rates, which was observed in 1994 and 2001. However, in general, the urban and rural homicide levels are very close.

- Over time, higher figures for accidental falls are registered in the urban areas.

- The rural pattern of violent mortality can be described by explicitly higher rates of suicide and fatal alcohol poisonings.

- Over time, there is an excess in drowning and accidents caused by fire in the rural areas.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rural</td>
<td>Urban</td>
<td>Rural</td>
<td>Urban</td>
</tr>
<tr>
<td>motor vehicle traffic accidents involving collision with pedestrians</td>
<td>15.9</td>
<td>12.7</td>
<td>15.2</td>
<td>14.2</td>
</tr>
<tr>
<td>accidental poisoning by alcohol</td>
<td>12.5</td>
<td>8.3</td>
<td>42.6</td>
<td>36.1</td>
</tr>
<tr>
<td>accidental poisoning by other substances, gases and vapours</td>
<td>11.4</td>
<td>7.3</td>
<td>14.5</td>
<td>12.3</td>
</tr>
<tr>
<td>complications of surgical and medical procedures</td>
<td>0.3</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
</tr>
<tr>
<td>accidental falls</td>
<td>3.2</td>
<td>6.1</td>
<td>4.1</td>
<td>7.9</td>
</tr>
<tr>
<td>accidents caused by fire and flames</td>
<td>4.1</td>
<td>2.4</td>
<td>8.1</td>
<td>5.8</td>
</tr>
<tr>
<td>accidental drowning</td>
<td>12.4</td>
<td>7.0</td>
<td>17.8</td>
<td>9.9</td>
</tr>
<tr>
<td>accidental mechanical suffocation</td>
<td>4.4</td>
<td>2.5</td>
<td>8.1</td>
<td>6.3</td>
</tr>
<tr>
<td>accidents caused by firearm missile</td>
<td>0.6</td>
<td>0.2</td>
<td>0.8</td>
<td>0.4</td>
</tr>
<tr>
<td>accident caused by electric current</td>
<td>2.7</td>
<td>1.5</td>
<td>2.8</td>
<td>1.4</td>
</tr>
<tr>
<td>suicide</td>
<td>33.5</td>
<td>24.6</td>
<td>55.9</td>
<td>37.1</td>
</tr>
<tr>
<td>homicide</td>
<td>14.6</td>
<td>12.0</td>
<td>30.4</td>
<td>31.8</td>
</tr>
<tr>
<td>injury undetermined</td>
<td>7.5</td>
<td>10.4</td>
<td>21.2</td>
<td>38.5</td>
</tr>
</tbody>
</table>

Data source: GOSKOMSTAT / FAIRS (state: 2002)

1.3.4 Socioeconomic status (SES) and other factors

The evidence from population-based studies documents clear relationships between socio-economic status (SES) determinants and violent and accidental mortality. For example, findings from the National Longitudinal Mortality Study (USA) indicate an independent effect of household head's education on youth homicide and unintentional injury mortality risk (Hussey 1997). In the New-Zealand Census Mortality Study, unemployed males and females aged 25-64 years demonstrated more than 2.5 times increased suicide rates, compared to employed people (Blakely et al 2002). In the Netherlands, per capita income has been found to be the strongest predictor of regional differences in traffic accidents mortality (van Beeck et al 1991).
The recent study in Russia, using cross-sectional mortality data around the 1979 and 1989 Censuses, analysed mortality gradients according to length of education in people aged 20-69 years (Shkolnikov et al 1998). With respect to accidents and violent deaths, mortality differentials between the aggregated educational strata were especially large: death rates among men and women with primary or basic secondary education exceeded over twice the death rates of higher educated people. Even larger differences have been discovered for alcohol-related causes, including accidental poisoning by alcohol. The strength of association of mortality with education has been found to decline with age, reaching its maximum between age 25 and 35 for violent causes.

Although these findings seem to be consistent with results of studies carried out in the Western countries, they are not free from serious methodological limitations due to possible numerator-denumerator biases, in which classification of educational level may differ systematically in some way between Census (“self-promotion”) and death (post-mortem “promotion” by family or friends). Thus, the reported educational mortality differentials in Russian are likely to be underestimated.

The materials from the 1994 representative micro-census, which covered a 20% sample of the Russian population, have been used to obtain estimates of education for the age group 16 and above. For all-cause mortality, the educational differentials appeared to increase by 15-20% over the period 1990-1994 (Shkolnikov et al 1998).

At the individual level, a study applying a case-control design has been carried out in Moscow and in Udmurt Republic (Shkolnikov 2000 p65-84). For social, psychological and lifestyle characteristics, the information about “cases” – deceased urban males aged 20-55 years, died in 1998-1999 in Moscow and Udmurt Republic – has been collected from their relatives. The death certificates were available in Udmurt Republic, but not in Moscow. Consequently, classification bias with respect to cause-of-death specification was difficult to avoid. The “cases” have been matched with “controls” – survived male neighbours in the same age, who acted as respondents themselves. For the external death causes, there were 202 pairs in Udmurt urban areas and 195 pairs in Moscow.

In Udmurt Republic, being unemployed or part-time employed has been found to be an important and significant risk factor for violent and accidental deaths (OR=2.8), while for Moscow it was high, but not significant. In both samples, odds ratios for the low educational status demonstrated high values. However, they were significant only in Moscow (OR=2.7). The discrepancies in significance between Moscow and Udmurt Republic have been attributed to a small sample size.

For other than SES-related characteristics, high odds ratios have been found for marital status (never married), increased alcohol consumption, hangovers three times per week and more frequently, as well as depressed mood. However, they were significant only in one of the both samples.

1.3.5 Alcohol consumption

Several research groups believed that the increased alcohol consumption – together with the hazardous habit of binge drinking – is the key determinant of rising violent and accidental mortality in Russia (Leon et al 1997; Ryan 1995). The real magnitude of this increase is, however, difficult to estimate: apart from official sales statistics, illicit alcohol production and home breeding need to be taken into account. The Russian Longitudinal Monitoring Survey, a periodic survey of representative households’ samples, showed an increase in mean alcohol consumption from late 1992 to August 1993. According to the Survey results, 82% of male respondents drank daily mean of 59.6 grams pure alcohol. 57% of female respondents reported the daily mean of 14.5 grams. As this Survey did not involve the heaviest drinkers, who are most likely to be affected by violent and accidental mortality – and most likely to consume cheap low-quality illicitly produced
alcoholic beverages or toxic surrogates – the inferences about the total real alcohol consumption are very hard to draw. Equally, based on these figures, it is impossible to analyse correctly an impact of alcohol consumption on violent mortality.

Nemtsov (2000) derived his estimates of total alcohol consumption from the data analyses of blood alcohol coefficients, gathered from forensic reports on violent and accidental deaths in 17-25 Russian regions in 1981-1994. Thus, the real figure for 1984 exceeded 14 litres pure alcohol per capita per annum. During the anti-alcohol campaign (1986), alcohol consumption dropped to 10.8 litres. In the following years it began to rise, climbing to 13.6 litres in 1993. A slight decline to 13.3 litres has been estimated for 1994. Nevertheless, the figures for the indicators of “alcohol-related harm” in 1994 – measured by hospital admission rates for alcoholic psychoses, deaths rates from alcohol poisonings, and other violent deaths – exceeded those recorded at the end of the stagnation period (1984). Consequently, increasing in drinking prevalence alone would not explain the rise observed in violent mortality.

On the other hand, alcohol may – at least partly – mediate other factors, acting via psychological mechanisms – e.g., stress caused by the rapidly changing socio-economic conditions. Half of the drinking men in Moscow reported that alcohol makes them more optimistic about life, compared to only 20% of men in Finland (Mustonen 1997 125-147). However, there is no direct empirical evidence that alcohol consumption is related to perception of the changed situation, as measured by reaction to economic and political changes, impact of market reform, rating of family economic situation now and compared to 5 years ago, economic expectations in the future, role and responsibility of state, general satisfaction and political preferences (Bobak et al 1999). These results have been obtained in the cross-sectional 6th New Russia Barometer survey carried out in 1996 with a multi-stage random sample of men and women of the Russian Federation (N=1599, response rate 66%). An absolute material deprivation, estimated by questions about how often the respondents do without food, heating or necessary clothes/shoes, also provided no association with alcohol consumption. Statistically significant positive relationships have been found for males with employment (being unemployed) and marital status (unmarried), as well as poor self-rated health and smoking.

These results contradict to estimations of Cockerham (2000), concluding that alcohol use is the greatest among employed married middle-age men, who live in urban areas and have higher (but not the highest) income and education. Therefore, the poor lifestyles of Russian middle-aged working-class men are assumed to be the primary determinants of the downturn in the life expectancy. The analyses of Cockerham based on data from 8402 respondents collected in 1995 by the Russian Longitudinal Monitoring Survey.

Indeed, the lacking consistency of these results was attributed to different measurements of alcohol consumption: the Longitudinal Monitoring Survey did not take into account the quantity of alcohol consumed, questioning the respondents only about frequency of their drinking, while for the 6th New Russia Barometer Survey, the quantitative estimation of alcohol consumption represented an issue of interest. It is important to consider that recall bias is more likely to occur with respect to frequency of drinking, especially in heavy drinkers with alcohol-related brain damage, while the amount of vodka/wine/beer consumed remains more or less constant in the short/middle term. Therefore, alcohol use among the heaviest drinkers, who are more likely to be unemployed and unmarried, may be seriously underestimated in the study by Cockerham.

Even more problematic is a survey-based estimation of alcohol consumption in the female population. If drinking reflects traditional “male culture” in Russia, the societal tolerance of this phenomenon in women is rather low. Thus, being considered as an undesirable behaviour, female alcohol consumption is much more likely to be significantly underestimated in the studies.
INTRODUCTION

In sum, the links between the socio-economic situation/lifestyle behaviour and violent mortality remain largely debatable for the Russian Federation.

1.4 Socio-economic transition – is it dangerous for health?

The research material discussed in the previous subsections relates mostly to static indicators, hypothesised to have an impact on violent mortality. The transition is, however, a dynamic process, characterised by changes in virtually all life spheres.

At the macroeconomic level, the transition process means the replacement of the planned socialist by the market economy. The “start conditions” to the end of 80s were characterised by a virtually complete nationalisation of business, state control of almost all prices in the economy, state monopoly in foreign trade and a complex administrative (bureaucratic) system. Resource allocation was directed in a centralised fashion through a planning apparatus, controlled by the Communist Party, which set objectives for economic development. Industrial ministries and state committees were major intermediaries between planners at the upper level and producing units at the local level. Planners’ preferences, dictated through the planning hierarchy, replaced consumer preferences. In the economic literature, these characteristics are referred to as an “administrative command economic system” (Gregory & Stuart 1998 p3-20). The demand structure of the Soviet economy favoured selected priority branches (heavy industry), especially defence, metallurgy, machine building and electricity. Others had been deliberately underrepresented in the Soviet Union, such as light industry, service and transportation.

The components of transition are determined by the differences between the initial and the target economic system. In the case of the Russian Federation they included:

- Creation of markets and market institutions and the forces of supply and demand through the privatisation of formerly state owned assets;
- Creation of the macroeconomic institutions of a market economy, especially banking and financial institutions, market-oriented monetary and fiscal policies;
- Price and trade liberalisation;
- Creation of market-type institutions and policies for the exercise of international trade, liberalisation of the foreign trade;
- Creation of policies pertaining to social support services.

These processes led to changes in the economic structure, i.e. a “marketisation” of demand or its shifting from heavy industry towards consumer-oriented branches. Forced changes of the economic structure, associated with the collapse of traditional economic relationships (the Soviet Union breakdown), resulted in a period of economic instability with a considerable drop of industrial production in the Russian Federation. From 1991 to 1998, the overall industrial production declined by 49%, while for machine building this decrease amounted to 56% (GOSKOMSTAT 2000 p17-62). After the foreign trade liberalisation, Russian light and food industry failed to compete with imported goods and experienced a production collapse, comparable to that in heavy industry.

During the transition period in the Russian Federation, a relatively favourable situation has been observed in the fuel (gas and oil) industry, ferrous and non-ferrous metallurgy, some branches of the chemical and petrochemical industry, woodworking, as well as pulp and paper. Despite a moderate drop in production, resulting from reduced demand in crisis-affected domestic economic branches, these industries have been able to find new commodity markets abroad. Thus,
the production crisis in these industries has been somewhat mitigated and levelled-out. In some favourable branches (e.g., oil industry), even an increase of production has been achieved.

However, the described macroeconomic disturbances could not damage the population's health directly. As an intermediary chain between the population's health and the economy, changes in conditions related to the population's living standards can be considered, such as unemployment in the crisis-affected branches, delays in payments of salaries/wages, inflation, growing income inequalities etc. The time-series models of mortality rates in relation to economic change and unemployment (Brenner 2003) indicate a significant impact of economic conditions on health in Russia, Poland and Hungary.

On the other hand, it is impossible to disregard psychological factors, like difficulties of people's adjustment to the new developments in areas of great psychological concern, relative deprivation and stress, uncertainty about the future – in other words, the factors that are extremely difficult to measure at the population level.

During the first reform years, all Central and Eastern European transition countries reported more or less pronounced increases in mortality. The duration and extent of this mortality crisis were, however, not the same in all affected countries (Cornia & Panicciá 2000 p5-8):

- In the Czech Republic, Slovakia, Poland and the former GDR, a modest and temporary rise in mortality has been recorded, followed by a rapid decline;
- In the countries like Bulgaria, Romania and Hungary there was a moderate increase in mortality, which finally stabilised and was followed by a subsequent decline;
- A large and accelerating increase in mortality has been observed in the Baltic countries (Lithuania, Latvia and Estonia). These trends started to reverse in 1995/1996. For the year 2000, Lithuania demonstrated a higher level of life expectancy than in the most successful period of the Soviet anti-alcohol campaign (1986). In Latvia and Estonia, this growth in life expectancy was less straightforward, having been interrupted for a short time in 1998. Nevertheless, in both countries, the level of life expectancy for the year 2000 exceeds the pre-transition 1989 values.
- In Russia, Ukraine, Belarus and Moldova, the surge in mortality was delayed, and not yet stabilised.

Despite the above described differences in the levels and dynamics of mortality, there are some common features, characterising changes of populations health observed over the period of the socio-economic transition in all these countries:

- First of all, mortality fluctuations in all transitional countries of Central and Eastern Europe are largely attributed to changes in cardiovascular and violent deaths levels.
- The major mortality fluctuations concentrated around the most difficult years of important socio-economic changes.
- Women experienced less acute variations in deaths due to external causes.
- Specifically, middle-aged men living in urban areas, with lower education and skill levels, unstable family background, have been substantially affected by the mortality crisis.

In order to interpret the Eastern European mortality crisis, Bacci (2000 p38-58) and Cornia (2000 p59-82) offer a review of mortality models existing in the literature (Table 1-4).
### Table 1-4 Summary features of main long-term, short-term and hysteresis models

<table>
<thead>
<tr>
<th>Features</th>
<th>Long-term mortality models</th>
<th>Short-term models of mortality crisis</th>
<th>Hysteresis models</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Income</td>
<td>Health technology</td>
<td>Lifestyles</td>
</tr>
<tr>
<td>Immediate causes of death</td>
<td>Poverty diseases</td>
<td>Preventable diseases</td>
<td>Degenerative diseases</td>
</tr>
<tr>
<td>Main age groups affected</td>
<td>Children</td>
<td>Most age groups</td>
<td>Adults and elderly</td>
</tr>
<tr>
<td>Gender differentials</td>
<td>None</td>
<td>None</td>
<td>Males more than females</td>
</tr>
<tr>
<td>Social groups affected</td>
<td>Low income</td>
<td>All groups, poor in particular</td>
<td>Low income &amp; education</td>
</tr>
<tr>
<td>Speed of change of mortality rates</td>
<td>Steady decrease/slow increase</td>
<td>Slow progress/deterioration</td>
<td>Slow progress/deterioration</td>
</tr>
<tr>
<td>Underlying causes</td>
<td>Economic development</td>
<td>Technological progress</td>
<td>Information, knowledge</td>
</tr>
</tbody>
</table>

Source: Cornia (2000 p78)
INTRODUCTION

Both authors agree that the recent mortality crisis in the transitional countries can not be fully explained by the epidemics/famine/war models, as these models refer to greater social dislocations than those observed under the relatively peaceful conditions characterizing the transition. In addition, the population groups affected by starvation, exhaustion, endemic diseases and epidemics – the old, the very young and the biologically vulnerable – differ from those affected recently in the transition countries.

Further, Cornia believes that the recession model may be able to explain mortality increases among the poorest population strata, while it fails to interpret the recent overall health deterioration. The author assumes that if a pre-recession per capita income exceeds a definite threshold – more than 3,000-5,000 US$ per capita – there will be no evidence of rising mortality due to “poverty diseases” during recession, as it was in the US Great Depression of 1929-33. Indeed, there is a resurgence of tuberculosis in Russia with the quickest growth of notifications and mortality rates around 1994 and after the economic crisis of August 1998 (Shilova & Dye 2001). Nevertheless, the absolute contribution of “poverty diseases” to the overall mortality increase was minimal.

The model of unemployment with its emphasises on mental stress and relative deprivation in context of social hierarchies, suggests an explanation of mortality increase among the older, less skilled, less educated and adaptable workers, argues Cornia. Loss of prestige, purpose, and social identity has been common among the former “labour elite”, the middle-aged, semi-skilled workers employed in heavy industry and the communist party. However, the author comments, this model cannot explain the rapidity of mortality changes during the transition.

Any of the long-term models – like those emphasising changes in income, medical technologies or shifts in lifestyle - could be useful to interpret regional structural health gaps, concludes Cornia. Nevertheless, these models appear less successful in the explanation of the recent crisis.

Summarising the discussions as to which mortality model fits the Eastern European crisis, the author argues in favour of acute psychosocial stress. Both the rapidity of mortality changes and the structure of excess mortality – by age, gender and causes of death – seem to be better predicted by this model. The socio-economic transition entailed large unanticipated changes, like unemployment, migration distress, shifts in social hierarchies in the absence of appropriate coping mechanisms in the populations affected.

None of the described models can, however, fully explain the differences between the transitional countries with respect to the extent and duration of the mortality crisis.

1.5 Measures of transition and acute psychosocial stress in the recent research literature

Assuming the transition-related mortality changes as a result of acute psychosocial stress of “disruption” and “adaptation”, series of research papers have been dedicated to the testing of this hypothesis. Basically, this assumption seems to generalise the classical Durkheim’s idea: in his pioneering work on suicide (1897), the author concluded that “whenever serious readjustments take place in the social order, whether or not due to a sudden growth or to unexpected catastrophe, men are more inclined to self destruction”.

The basic argument refers to conditions, when stress – as a pathological process associated with bodily reactions to external forces and disturbing the organism’s homeostasis – could manifest. Namely, people develop stress when they cannot control the most important areas of their lives. Correspondingly, the transition-related changes in Russia – their speed and extent – caused an increased stress level in the population, as the situation in vital areas of people’s lives became
unpredictable to a considerable degree and led to a great uncertainty about the people’s future (Shapiro 1995 p149-178; Anderson 1997; Leon & Shkolnikov 1998; Stone 2000). Further, stress – via direct pathophysiological mechanisms (Algra et al 1993; Anda et al 1993; Brunner 1997) or through traditional risk factors including “unhealthy behaviour” like smoking, excessive drinking, drug addiction etc – is linked to mortality increase from violent causes, cardiovascular diseases, etc (McKee & Shkolnikov 2001).

This model seems to be biologically very plausible. However, in the macro-level studies, there is still no evidence of these links. Discussing stress and its impact on mortality in Russia, the commentators usually refer to the factors hypothesised to play a role of stressors – e.g., unemployment rising from a nominally zero start point, increasing income inequality in the former egalitarian society, relative material deprivation, economic and social instability and shifting of the state’s responsibilities that forced people to care for their basic needs (health).

Those who tried to capture the transition-related stress as an invisible population’s killer used combined measurements of these hypothetical stressors. For example, Anderson (1997) referred to an “index of psychosocial stress” in the formerly-Soviet Eastern Europe that represented a combination of the average price index, rate of inflation (1989/1994), and percentage of workers who had been unemployed for 1 year or longer.

Another example of the “stress index” has been illustrated in the research paper of Cornia & Panicià (1996). The authors have regressed crude death rates for 13 transition countries (1989/1994) on a stress index summarising the impact of rising unemployment and inflation, and on an index of real health expenditures per capita. Their model explained 51 per cent of the crude death rate variance. The “psychosocial stress” explained a share of the observed variation in mortality twice that of health expenditures per capita.

Using a similar approach, Cornia (1996) analysed the 1989/1994 changes in life expectancy and standardised death rates due to cardiovascular and external causes in 12 Russian macro-regions in conjunction with a stress indicator. This indicator has been approximated by the first principal component of the unemployment rate, labour turnover, and changes in marriage and divorce rates. In addition, Cornia involved “the frustration caused by changes in social hierarchies”, measured by shifts in the Gini coefficient, and a dummy for atypical situation of the Caucasus regions. The regression delivered the R-squared ranged between 0.65 and 0.81, and the “psychosocial stress” explained the greatest part of the variance of the dependent variable. Even with this tiny set of units analysed, Cornia got significant results.

For the further testing of the stress hypothesis’s validity, Cornia (2000) carried out regression analyses with more disaggregated regional data, including 47-50 oblasts of European Russia and 17 Siberian regions. Tuva, Republic of Kalmykia, Dagestan, Chechnya and Kabardino-Balkaria were eliminated due to data problems and inconsistencies. The author concluded that there is a northern-southern mortality gradient, with the oblasts of Eastern Siberia particularly affected by mortality increase. Cornia assumed that the extent, speed and impact of the economic restructuring can play the key role in the regional patterns of mortality changes, as the Russian regions of the “northern belt” experienced greater than average increase in unemployment rates, job insecurity, labour turnover and employment in hard manual or unregulated jobs. Other factors like migration, growing income inequality, and family instability (divorces) have also been explained in association with the economic restructuring.

As dependent variables, 1989/1994 changes in the standardised death rates have been used for the population aged 14-60 years due to (1) all causes, (2) violent deaths and (3) cardiovascular diseases.

As explanatory variables, Cornia included in the regression model: (1) urbanisation rate in 1994, (2) indicator of family instability, constructed as a sum of the absolute value of the changes in the
crude marriage and crude divorce rates per 1,000 people over 1989/1994; (3) labour turnover, measured as a sum of the 1994 quit ratio and new hire ratio per 100 workers; (4) unemployment rate in 1994; (5) share of expenditure on basic needs, including food, heating, rent, water charges, health care and education; (6) changes in the numbers of physicians per 1,000 population over 1989/1994; (7) overall crime rate in 1994 and (8) “psychosocial stress” indicator, approximated by the first principal component of the variables characterising labour turnover, unemployment and family instability.

In the discussion, the author pointed out that the “psychosocial stress” explains the greatest part of overall variance in mortality for the European regions of Russia. Its impact is about 2.5 times higher in men than in women. In the case of external mortality, crime plays an equivalent role.

Another model, involving “general pathogenic social stress”, was suggested by Mäkinen (2000). It was developed to examine the impact of the transition process on suicide mortality in 27 states of the former Eastern Block over 1984-1994. Mäkinen approximated “general pathogenic social stress” by changes in life expectancy at births between 1984/89, 1989/94 and 1984/94. Apart from purely data-related problems, the author could not avoid an estimation bias, resulting from the overlap of suicide and all-cause mortality – i.e. the basis for the life expectancy calculation. In addition to this stress indicator, Mäkinen used the following independent variables: (1) change in per capita alcohol consumption; (2) change in the economic situation, constructed from heterogeneous indicators, as the time span of interest has been divided into two sub-periods where different measurements of economic development have been used; (3) political situation, measured by scoring of democratic rights and freedoms; and (4) change in societal (de)sorganisation, estimated by homicide rates and their changes. The “best fitting” regression model explained more than 92% of the variation in changes of suicide rates, and it has been obtained with a combination of changes in life expectancy, alcohol consumption, democratisation and homicide, while economic development “seemed to exert less influence on suicide rates than has been expected”. However, the results of this research study are difficult to interpret – first of all, due to the problems in the conceptual definition of explanatory indicators, as well as due to their overlap.

Summing up the discussion about transition-related stress, it is possible to conclude that both the concept definitions and measurements are in the “formation stage”. Emphasising the crucial role of transition-related changes, the followers of this hypothesis developed concept measurements, based on changes of the relevant indicators rather than their levels.

With respect to “measures of transition” two further research papers deserve special attention, as they use a similar approach in order to capture the impact of “transition” on mortality in the regions of the Russian Federation.

Walberg et al (1998) analysed changes in male life expectancy at birth over 1990/1994 for 52 European regions of Russia in conjunction with a set of independent variables, including four broad categories: (1) change in average household income over 1990/1994, adjusted for changes in the consumer price index; (2) equity measured by the Robin Hood index for 1994; (3) “transition”, otherwise interpreted as “labour market shock”, estimated by the labour turnover in medium and large enterprises in 1993 and 1994; and (4) social cohesion, approximated by crime 1990/1994.

The results have shown that the fall in male life expectancy was most closely correlated with “transition”, followed by income in 1990 – with the wealthiest regions experiencing the greatest fall in life expectancy – and then by the crime increase. Taken together, these variables explained 56% of the regional variation of changes in life expectancy. Walberg and colleagues concluded that regions with the largest fall of life expectancy were mostly urban, with high rates of labour turnover, large increases in recorded crime, and a higher average but unequal distribution of the household income. The authors interpreted their results, developing a putative mortality/morbidity
model, where “transition” seemed to play a role of a driving force, exacerbated by inequality and mediated by psychosocial stress.

The regression analyses of Shkolnikov & Cornia (2000) have been aimed at capturing an impact of “changes in socioeconomic conditions” on male life expectancy in 47 European regions of Russia. Five variables – from initially 32 selected – demonstrated the strongest correlation with fall in male life expectancy between 1987 and 1994: (1) the increase in life expectancy in the previous period, i.e. between 1984 and 1987, interpreted as a variable reflecting “partial return to the long-term mortality pattern”; (2) the labour turnover during 1992-1994; (3) the percentage decline in real per capita money income over 1990/1994; (4) the percentage decrease in the number of physicians per 1.000 residents; and (5) the proportion of the urban population in 1989. These variables jointly explained 82% of the variation in the dependent variable. Among other indicators which were significantly associated with the fall in life expectancy, but not included in the regression, the proportion of employees working in hazardous conditions or hard manual jobs, the food-share (sic?), and the crime rate have been listed by the authors. Again, the labour turnover showed the strongest relative contribution in the prediction of the dependent variable, followed by increase of life expectancy during the previous period, urbanisation, income fall and the indicator of healthcare system deterioration.

In the regional studies discussed, the regression coefficient for the income fall exhibited a negative sign, contrary to expected results. This paradox was explained by a possible confounding. Thus, in the wealthier regions – which are more industrialised and urbanised – the income fall was less considerable. There were, however, other factors associated with urbanisation and economic restructuring in industry, which could significantly contribute to a greater fall in life expectancy in these regions – e.g., drastic increase of income inequalities, higher prices, higher unemployment, worse household conditions and higher crime level. And there is evidence of a faster increase in urban mortality rates over the period 1989/1994.

The measure of labour turnover demonstrated a strong association with the increase in mortality over the transition period. However, the meaning of this indicator is quite ambiguous:

- Labour turnover may be attributed to the changes in the economic structure;
- It can reflect labour market tensions, resulting from a transition-related enterprises restructuring – i.e. reorganising, dissolution of state-owned enterprises, creation of jobs in newly organised firms and commercial companies;
- It can mirror work stress due to lack of employment stability, hazardous working conditions, poor social protection and medical insurance systems;
- It may refer to the general economic crisis, when long-lasting arrears in wage payments or very low salaries forced people to leave their working places and seek new ones, or to become self-employed;
- And, finally, this indicator can be absolutely meaningless. When privatisation of state enterprises takes place, personnel departments formally registered mass discharges and hirings of employees. People remain employed without any changes in their working conditions or salaries. In some cases, formerly state-owned enterprises became joint-stock companies with 100% shares remaining in the State hands.

It is difficult to disagree that all these factors can jointly cause an enormous increase of stress levels in the population. Additional problems, associated with these conditions – like widening income inequality, loss of the social status and prestige for those who did not belong to the winners in the world of the new economic reality, growing instability of personal relationships, family disruptions, increasing crime level – may significantly contribute to further distress.
In conclusion, some general inferences can be drawn from these studies.

First, the indicators related to the changes in the socio-economic situation seem to be better associated with the changes in mortality.

Second, following the models reviewed, we can suggest an explanation for the increased vulnerability of middle-aged people, particularly those with low skills and education levels:

- Their principal areas of concern involve economic activity, while the pensioners – despite a generally lower income level – are no longer exposed to losses or relative deprivation in this field;
- On the other hand, these population groups can not successfully cope with rapid changes, as compared to younger/higher educated people.

Third, the aggregate-level measures of the socioeconomic transition and stress are still “under construction”. They have some serious limitations:

- The meaning of some indices – like labour turnover – is hard to understand and interpret;
- The factors constituting the complex indices of “transition” or “stress” are closely interrelated in some of the studies reviewed;
- Finally, an isolated impact of each particular hypothetical stressor on health can not be estimated, if the complex indices are used.
CHAPTER 2 – SPATIAL ASPECTS OF MORTALITY IN THE REGIONS OF THE RUSSIAN FEDERATION
2.1 Introduction

The overview of literature left us with the conclusion that the transition-related socioeconomic reforms – and their painful “side-effects” – could have brought about increasing levels of mortality in the Russian Federation. “Rapid unanticipated changes” have been closely linked with stress and related mortality outcomes. However, the existing approaches to measuring the impact of stress and transition have serious limitations. In this respect, a careful revision of measurement approaches is required in order to provide a better understanding of relationships between the transition-related challenges and mortality.

The materials of this chapter should prepare the basis for the refinement of measurements. Let us start with the simple research questions:

– What patterns in the spatial distribution of violent and accidental mortality can be identified for the administrative areas – referred to as regions or provinces – of Russia?

– Are there some common characteristics of the regional environment in high- and low-mortality areas? Do these characteristics refer to some specific economic conditions; are there other typical parameters?

Therefore, we elaborate a typology of Russian regions, based on a variety of potentially measurable parameters. This typology will take into account the levels and dynamics of violent and accidental mortality over the period of the socioeconomic transition. At the same time, it will consider the important features of the regional environment, which may determine mortality patterns.

In this chapter, the issues of stress measurement are avoided. We also deliberately avoid thinking in categories of complex, hardly interpretable indices of transition and stress.

2.2 Data and methods

We synthesise the evidence from two sources.

The first source is the original database FAIRS – Factographic Automated Information Reference System Potential – which comprises regional data on mortality and population from the state statistics sources (GOSKOMSTAT) of the Russian Federation.

Altogether, there are 89 official areas (the so-called “subjects”) of the Russian Federation which are referred to in six destinations: Respublika (Republic), krai (territory), avtonomnyi okrug (autonomous district), avtonomnaya oblast’ (autonomous region), oblast’ (region) and two major cities – Moscow and St. Petersburg. Due to the problems of data quality, 12 “atypical” areas with incomplete data or low population size were excluded. Therefore, the total number of regions analysed equals to 77.

The annual data on cause-specific death rates, age-standardised by the European population (SDR per 100 000 inhabitants, both sexes), covered the time span of 12 years (1990-2001). By means of the cluster analysis – k-means method – we elaborated a classification of regions. This classification takes into account both levels and dynamics of mortality rates due to suicide,

6 areas excluded: Aginskii Buryatskii avtonomnyi okrug, Chechenskaya Respublika, Chukotskii avtonomnyi okrug, Evenkiiskii avtonomnyi okrug, Ingushskaya Respublika, Khanty-Mansiiskii avtonomnyi okrug, Komi-Permyatskii avtonomnyi okrug, Koryakskii avtonomnyi okrug, Nenetskii avtonomnyi okrug, Taymyrskii (Dolgano-Nenetskii) avtonomnyi okrug, Ust'-Ordynskii Buryatskii avtonomnyi okrug, Yamalo-Nenetskii avtonomnyi okrug.
homicide and accidental poisoning by alcohol. For the exact definitions of death causes see Table 1-1 in the previous chapter.

For each cause of death, the analysis yielded ten regional clusters by annual levels of mortality rates. We obtained the same number of clusters for the dynamics of mortality, which has been estimated as SDR changes (in percent) between 1990 and 1994, 1994 and 1998, and 1998 and 2001. These clusters were aggregated in nine groups:

- GROUP 1 – regions with low levels / low changes of mortality rates,
- GROUP 2 – regions with low levels / middle changes of mortality rates,
- GROUP 3 – regions with low levels / high changes of mortality rates,
- GROUP 4 – regions with middle levels / low changes of mortality rates,
- GROUP 5 – regions with middle levels / middle changes of mortality rates,
- GROUP 6 – regions with middle levels / high changes of mortality rates,
- GROUP 7 – regions with high levels / low changes of mortality rates,
- GROUP 8 – regions with high levels / middle changes of mortality rates and
- GROUP 9 – regions with high levels / high changes of mortality rates.

This approach enabled us to locate “good” and “bad” provinces and to describe the spatial distribution of high- and low-mortality zones in accordance with the so-called “economic regions” (eko-nomiceshki ii raion). The economic regions are defined as groups of administrative areas with common paths of historical development; close geographic location, similar profiles of economic specialisation and specific characteristics of human and natural resources (Alekseev & Nikolina 2002 p193). The list of administrative areas by economic regions is given in Table 2-4.

In addition, annual age-adjusted region-specific death rates were cartographically visualised by means of the Arc View Geographic Information System – separately for suicide, homicide and alcohol poisoning mortality, for 1990-2000 (see Annex-Maps).

The second source of evidence includes publications on regional economics in the Russian Federation. We have carefully reviewed official statistical data, textbooks, reference books and studies, which examined a variety of regional environment parameters – for instance, initial conditions and changes of the economic structure during the socioeconomic transition, development of consumer prices, real available income of the population, labour market situation etc.

These publications have been used to identify common characteristics of regional environment – potentially important as measurable determinants of mortality – for each particular high- and low-mortality zone.

2.3 Results – regional patterns of mortality

2.3.1 Suicide

Table 2-1 presents the results of the regional grouping by levels and dynamics of suicide mortality rates. The mean annual death rates for each particular group of regions are shown in Figure 2-1. The spatial distribution of suicide mortality indicates the presence of “zonal patterns”.

In the regions of the North Caucasus, suicide deaths are rather uncommon. Mortality rates are mostly stable – except for the Republics of North Ossetia and Karachaev-Circassian, where they are very dynamic, as well as Stavropol territory and Dagestan with moderate SDR changes.

The Central Blackearth – including Kursk, Lipetsk, Tambov, Voronezh and Belgorod regions – is rather homogeneous with respect to suicide mortality. These areas demonstrate low SDR levels and predominantly small changes.
### Table 2-1 Groups of regions by level and dynamics of suicide mortality rates

<table>
<thead>
<tr>
<th>LOW LEVEL</th>
<th>MIDDLE LEVEL</th>
<th>HIGH LEVEL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GROUP 1</strong></td>
<td><strong>GROUP 4</strong></td>
<td><strong>GROUP 7</strong></td>
</tr>
<tr>
<td>LOW</td>
<td>LOW</td>
<td>LOW</td>
</tr>
<tr>
<td>CHANGES</td>
<td>CHANGES</td>
<td>CHANGES</td>
</tr>
<tr>
<td>Kabardian-Balkar Republic</td>
<td>Magadan region</td>
<td>Khabarovsk territory</td>
</tr>
<tr>
<td>Krasnodar territory</td>
<td>Tomsk region</td>
<td>Primorsky territory</td>
</tr>
<tr>
<td>Kursk region</td>
<td>Lipetsk region</td>
<td>Moscow region</td>
</tr>
<tr>
<td>Lipetsk region</td>
<td>Penza region</td>
<td>Republic of Adygeya</td>
</tr>
<tr>
<td>Moscow region</td>
<td>Republic of Adygeya</td>
<td>Rostov region</td>
</tr>
<tr>
<td>Penza region</td>
<td>St. Petersburg</td>
<td>Tambov region</td>
</tr>
<tr>
<td>Republic of Adygeya</td>
<td>Voronezh region</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>GROUP 2</strong></th>
<th><strong>GROUP 5</strong></th>
<th><strong>GROUP 8</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>MIDDLE</td>
<td>MIDDLE</td>
<td>MIDDLE</td>
</tr>
<tr>
<td>CHANGES</td>
<td>CHANGES</td>
<td>CHANGES</td>
</tr>
<tr>
<td>Belgorod region</td>
<td>Astrakhan region</td>
<td>Altai territory</td>
</tr>
<tr>
<td>Bryansk region</td>
<td>Murmansk region</td>
<td>Chelyabinsk region</td>
</tr>
<tr>
<td>Kaluga region</td>
<td>Novosibirsk region</td>
<td>Chuvash republic</td>
</tr>
<tr>
<td>Moscow</td>
<td>Omsk region</td>
<td>Irkutsk region</td>
</tr>
<tr>
<td>Nizhny Novgorod region</td>
<td>Republic of Sakha (Yakutia)</td>
<td>Kaliningrad region</td>
</tr>
<tr>
<td>Republic of Dagestan</td>
<td>Republic of Tatarstan</td>
<td>Kostroma region</td>
</tr>
<tr>
<td>Ryazan region</td>
<td>Saratov region</td>
<td>Krasnoyarsk territory</td>
</tr>
<tr>
<td>Samara region</td>
<td>Smolensk region</td>
<td>Kurgan region</td>
</tr>
<tr>
<td>Stavropol territory</td>
<td>Tyumen region</td>
<td>Novgorod region</td>
</tr>
<tr>
<td>Tula region</td>
<td></td>
<td>Republic of Komi</td>
</tr>
<tr>
<td>Volgograd region</td>
<td></td>
<td>Republic of Mari El</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Republic of Tuva</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vladimir region</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>GROUP 3</strong></th>
<th><strong>GROUP 6</strong></th>
<th><strong>GROUP 9</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>HIGH</td>
<td>HIGH</td>
<td>HIGH</td>
</tr>
<tr>
<td>CHANGES</td>
<td>CHANGES</td>
<td>CHANGES</td>
</tr>
<tr>
<td>Karachaev-Circassian</td>
<td>Kamchatka region</td>
<td>Amur region</td>
</tr>
<tr>
<td>Oryol region</td>
<td>Leningrad region</td>
<td>Arkhangelsk region</td>
</tr>
<tr>
<td>Republic of Mordovia</td>
<td>Republic of Kalmykia</td>
<td>Chita region</td>
</tr>
<tr>
<td>Republic of North Ossetia</td>
<td>Yaroslavl region</td>
<td>Ivanovo region</td>
</tr>
<tr>
<td>Ulyanovsk region</td>
<td></td>
<td>Jewish autonomous region</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kemerov region</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kirov region</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Orenburg region</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Perm region</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pskov region</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Republic of Altai</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Republic of Bashkortostan</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Republic of Buryatia</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Republic of Karelia</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Republic of Khakassia</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sakhalin region</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sverdlovsk region</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tver region</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Udmurt republic</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vologda region</td>
</tr>
</tbody>
</table>

*Source: Author’s classification based on the summary of cluster analysis (k-means method)*
SPATIAL ASPECTS OF MORTALITY

Figure 2-1. Mean annual suicide rates by groups of regions, both sexes

Data source: Author’s calculations

Low suicide mortality with small or moderate changes is also observed in two major cities, Moscow and St. Petersburg.

“High-suicide zone” occupies virtually the whole Southern Siberia towards the east from Tomsk and Novosibirsk regions. It includes large Eastern Siberian areas of Krasnoyarsk territory and Republic of Buryatia, Chita and Irkutsk regions, as well as Republics of Tuva and Khakasia. Three Western Siberian provinces are also extremely unfavourable with respect to their suicide levels – namely, Kemerov region, Republic of Altai and Altai territory. The whole Siberian “high suicide zone” demonstrates high or moderate SDR dynamics.

Four neighbouring Western Siberia provinces can be considered as relatively favourable – middle SDR levels, moderate or small changes are observed in Tyumen, Omsk, Tomsk and Novosibirsk regions.

The provinces of Far East – Jewish autonomous region, Amur, Khabarovsk, Primorsk and Sakhalin – extend the Siberian “high suicide zone”. As for the SDR dynamics, these regions represent extremes. That is, suicide mortality rates are either stable-high (Khabarovsk and Primorsk territories), or show pronounced fluctuations (Amur and Sakhalin regions, Jewish autonomous region).

“High-suicide zone” spreads across the whole Ural, involving Kurgan, Chelyabinsk, Orenburg, Perm and Sverdlovsk regions, as well as Bashkortostan and Udmurt Republics. The dynamics of SDR is mostly high in these provinces.

In the European part of the Russian territory, the “high suicide zone” does not reach the northern line of Blackearth; its southern boundary passes across the Central economic region – i.e. through Kostroma, Vladimir, Ivanovo and Tver. The European “high-suicide zone” includes in the
north Republics of Karelia and Komi, Arkhangelsk and Vologda regions. It covers two areas within the North-Western economic region – Novgorod and Pskov – as well as Kaliningrad region. Three provinces within the Volga-Vyatka economic region belong to the European “high suicide zone” as well – Kirov region, Chuvash Republic and Mariy El.

In the majority of the European “high-suicide” provinces, there are high or middle SDR changes. The gradient of suicide mortality dynamics tends to be directed towards north-west for the European sector.

2.3.2 Homicide

Table 2-2 shows the regional grouping for homicide mortality levels and changes. The average group death rates are illustrated in Figure 2-2.

The most striking observation is that “high-homicide zone” covers all provinces of the Eastern Siberian economic region – Republics of Tuva, Buryatia and Khakasia, Krasnoyarsk territory, Chita and Irkutsk regions. In these areas, homicide death rates fluctuate strongly or moderately. The only exception is Krasnoyarsk territory with its stable-high violent mortality.

The majority of the Western Siberian provinces – excluding Omsk and Novosibirsk regions – entered the “high-homicide zone”, thereby forming a bridge to the unfavourable Ural areas. The changes of death rates are estimated to be moderate or low in the Western Siberian regions.

All Ural provinces belong to the “high-homicide zone” – except for Bashkortostan, where the level of homicide mortality is low. Bashkortostan and Udmurt Republics, together with Chelyabinsk and
Perm regions exhibit moderate mortality changes. Homicide death rates remain relatively stable in Kurgan region, whereas Sverdlovsk and Orenburg demonstrate pronounced SDR fluctuations.

Table 2-2 Groups of regions by level and dynamics of homicide mortality rates

<table>
<thead>
<tr>
<th>LOW LEVEL</th>
<th>MIDDLE LEVEL</th>
<th>HIGH LEVEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>GROUP 1</td>
<td>GROUP 4</td>
<td>GROUP 7</td>
</tr>
<tr>
<td>LOW</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHANGES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Astrakhan region</td>
<td>Krasnodar territory</td>
<td>Altai territory</td>
</tr>
<tr>
<td>Belgorod region</td>
<td>Republic of Sakha (Yakutia)</td>
<td>Khabarovsk territory</td>
</tr>
<tr>
<td>Bryansk region</td>
<td>Ryazan region</td>
<td>Krasnoyarsk territory</td>
</tr>
<tr>
<td>Chuvash republic</td>
<td>Tambov region</td>
<td>Kurgan region</td>
</tr>
<tr>
<td>Kabardian-Balkar Republic</td>
<td>Vologda region</td>
<td>Tomsk region</td>
</tr>
<tr>
<td>Karachaev-Circassian</td>
<td></td>
<td>Tyumen region</td>
</tr>
<tr>
<td>Kursk region</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lipetsk region</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nizhny Novgorod region</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Penza region</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Republic of Adygeya</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Republic of Dagestan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Republic of North Ossetia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rostov region</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Samara region</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stavropol territory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Volgograd region</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GROUP 2</td>
<td>GROUP 5</td>
<td>GROUP 8</td>
</tr>
<tr>
<td>MIDDLE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHANGES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kaluga region</td>
<td>Ivanovo region</td>
<td>Amur region</td>
</tr>
<tr>
<td>Kirov region</td>
<td>Novgorod region</td>
<td>Arkhangel'sk region</td>
</tr>
<tr>
<td>Kostroma region</td>
<td>Novosibirsk region</td>
<td>Chelyabinsk region</td>
</tr>
<tr>
<td>Oryol region</td>
<td>Omsk region</td>
<td>Kemerov region</td>
</tr>
<tr>
<td>Republic of Bashkortostan</td>
<td>Republic of Kalmykia</td>
<td>Magadan region</td>
</tr>
<tr>
<td>Ulyanovsk region</td>
<td>Saratov region</td>
<td>Perm region</td>
</tr>
<tr>
<td>Vladimir region</td>
<td>Smolensk region</td>
<td>Republic of Altai</td>
</tr>
<tr>
<td>Voronezh region</td>
<td></td>
<td>Republic of Buryatia</td>
</tr>
<tr>
<td>GROUP 3</td>
<td>GROUP 6</td>
<td>GROUP 9</td>
</tr>
<tr>
<td>HIGH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHANGES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kaliningrad region</td>
<td>Kamchatka region</td>
<td>Chita region</td>
</tr>
<tr>
<td>Moscow</td>
<td>Leningrad region</td>
<td>Irkutsk region</td>
</tr>
<tr>
<td>Murmansk region</td>
<td>Moscow region</td>
<td>Jewish autonomous region</td>
</tr>
<tr>
<td>Republic of Mordovia</td>
<td>Yaroslavl region</td>
<td>Orenburg region</td>
</tr>
<tr>
<td>Republic of Tatarstan</td>
<td></td>
<td>Primorsky territory</td>
</tr>
<tr>
<td>St. Petersburg</td>
<td></td>
<td>Republic of Karelia</td>
</tr>
</tbody>
</table>

Source: Author's classification based on the summary of cluster analysis (k-means method)

Toward the east, the “high-homicide zone” spreads across Amur region, Khabarovsk and Primorsk territories, including Sakhalin, Magadan and Jewish autonomous region. Among the areas
within the Far East economic region, a relatively favourable situation is observed only in the Republic of Sakha, where homicide mortality level is moderately high and stable, and in Kamchatka. However, in the latter region, death rates are highly variable.

In general, the vast majority of the non-European provinces are extremely unfavourable with respect to homicide mortality.

In the European part of Russia, “high-homicide zone” covers smaller areas than “high-suicide zone”. The areas affected by the elevated homicide mortality are located mostly within the Northern economic region – Arkhangelsk, Karelia and Komi. Further, there are two provinces of the Central region – Tula and Tver – and Republic of Mariy El (Volga-Vyatka economic region), where homicide death rates are also elevated.

The list of “good provinces” contains only European areas. Here we can refer to the “low level / low changes” North Caucasus regions – except for Krasnodar territory, where the level of homicide mortality rates is high. Further, this list includes the majority of the Central Blackearth, Volga-Vyatka and Povolzh’e provinces, as well as Moscow and St. Petersburg. These two major cities show high dynamics of homicide rates. The same is true for Murmansk and Kaliningrad regions.

Finally, low levels of homicide rates are observed in five Central region provinces – Bryansk, Kaluga, Kostroma, Oryol and Vladimir, which can be characterised by predominantly moderate SDR fluctuations.

### 2.3.3 Accidental poisoning by alcohol

In this paper, fatal alcohol poisonings are referred to as “heavy binge drinking” mortality. Binge drinking – i.e. episodic excessive consumption of strong beverages, particularly, vodka – has been emphasised as a common pattern of drinking culture in Russia (McKee & Britton 1998; Chenet et al 1998). However, our analysis revealed an enormous regional diversity of heavy binge drinking mortality, with clear zonal patterns in the spatial distribution (Table 2-3; Figure 2-3).

The lowest alcohol poisoning mortality is observed in the provinces of the North Caucasus region: Krasnodar territory; Republics of Adygeya, Dagestan, North Osetia, Karachaev-Circassian and Kabardian-Balkar; Rostov region and Stavropol territory. These provinces show mostly small fluctuations of mortality rates – except for Dagestan and Kabardian-Balkar Republic, where SDR changes are high and moderate, respectively.

Alcohol-related deaths are also uncommon in some Republics with a relatively big proportion of Moslem population – Tatarstan and Bashkortostan. In the latter Republic, there was, however, a high variability of death rates across time.

“Low-level/low-change-mortality” has been recorded in two provinces of the Central Blackearth economic region – Kursk and Voronezh. Other areas of this economic region – Belgorod, Lipetsk and Tambov – came into the middle-level group with small or moderate SDR changes.

Smolensk region and Moscow-city – parts of the Central economic region – were placed into the low-level group with low or moderate changes. However, for the other Central regions, the picture of fatal alcohol poisonings is extremely mixed: Ivanovo, Kaluga and Vladimir regions belong to the middle group both for levels and changes, whereas the rest enters the high-level group – Oryol, Ryazan, Kostroma, Tula, Tver, Bryansk, Moscow region and Yaroslavl region.

The core of the high-level group is constituted by the northern regions of the European area – Arkhangelsk, Karelia and Komi. In the non-European areas, there are high mortality rates in the Southern Siberia – Republics of Tuva and Altai, Chita and Irkutsk regions – and Far East – Amur and Kamchatka. These regions show pronounced fluctuations of binge drinking mortality.
Table 2.3 Groups of regions by level and dynamics of alcohol poisoning mortality rates

<table>
<thead>
<tr>
<th>LOW LEVEL</th>
<th>MIDDLE LEVEL</th>
<th>HIGH LEVEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>GROUP 1</td>
<td>GROUP 4</td>
<td>GROUP 7</td>
</tr>
<tr>
<td>LOW</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHANGES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jewish autonomous region</td>
<td>Belgorod region</td>
<td>Chuvash republic</td>
</tr>
<tr>
<td>Karachaev-Circassian</td>
<td>Lipetsk region</td>
<td>Oryol region</td>
</tr>
<tr>
<td>Khабаровск territory</td>
<td>Omsk region</td>
<td>Penza region</td>
</tr>
<tr>
<td>Krasnodar territory</td>
<td></td>
<td>Ryazan region</td>
</tr>
<tr>
<td>Kursk region</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Republic of Adygeya</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Republic of North Ossetia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rostov region</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smolensk region</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stavropol territory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Voronezh region</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GROUP 2</td>
<td>GROUP 5</td>
<td>GROUP 8</td>
</tr>
<tr>
<td>MIDDLE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHANGES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chelyabinsk region</td>
<td>Astrakhan region</td>
<td>Altai territory</td>
</tr>
<tr>
<td>Kabardian-Balkar Republic</td>
<td>Ivanovo region</td>
<td>Kaliningrad region</td>
</tr>
<tr>
<td>Moscow</td>
<td>Kaluga region</td>
<td>Kemerov region</td>
</tr>
<tr>
<td>Primorsky territory</td>
<td>Kurgan region</td>
<td>Kostroma region</td>
</tr>
<tr>
<td>Republic of Mordovia</td>
<td>Murmansk region</td>
<td>Nizhny Novgorod region</td>
</tr>
<tr>
<td>Republic of Sakha (Yakutia)</td>
<td>Orenburg region</td>
<td>Novgorod region</td>
</tr>
<tr>
<td>Tyumen region</td>
<td>Pskov region</td>
<td>Republic of Mari El</td>
</tr>
<tr>
<td>Ulyanovsk region</td>
<td>Saratov region</td>
<td>Sakhalin region</td>
</tr>
<tr>
<td>Volgograd region</td>
<td>Tambov region</td>
<td>Tula region</td>
</tr>
<tr>
<td>Vologda region</td>
<td>Vladimir region</td>
<td>Tver region</td>
</tr>
<tr>
<td>GROUP 3</td>
<td>GROUP 6</td>
<td>GROUP 9</td>
</tr>
<tr>
<td>HIGH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHANGES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Novosibirsk region</td>
<td>Krasnoyarsk territory</td>
<td>Amur region</td>
</tr>
<tr>
<td>Republic of Bashkortostan</td>
<td>Magadan region</td>
<td>Arkhangel'sk region</td>
</tr>
<tr>
<td>Republic of Dagestan</td>
<td>Republic of Buryatia</td>
<td>Bryansk region</td>
</tr>
<tr>
<td>Republic of Kalmykia</td>
<td>Republic of Khakassia</td>
<td>Chita region</td>
</tr>
<tr>
<td>Samara region</td>
<td>St. Petersburg</td>
<td>Irkutsk region</td>
</tr>
<tr>
<td></td>
<td>Tomsk region</td>
<td>Kamchatka region</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kirov region</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Leningrad region</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Moscow region</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Perm region</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Republic of Altai</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Republic of Karelia</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Republic of Komi</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Republic of Tuva</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sverdlovsk region</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yaroslavl region</td>
</tr>
</tbody>
</table>

Source: Author’s classification based on the summary of cluster analysis (k-means method)

Altai territory and Kemerov region (Southern Siberia), Sakhalin (Far East) and Kaliningrad region (“Far West”) are also included in the high-level group, with somewhat more moderate changes of death rates.
The areas within the North-Western economic region can be subdivided into two groups. Heavy binge drinking is “highly popular” in Leningrad and Novgorod regions, whereas St. Petersburg-city and Pskov region exhibit middle levels of alcohol-related death rates. The fluctuations of death rates are either high or moderate in these areas.

Figure 2-3 Mean annual fatal alcohol poisoning rates by groups of regions, both sexes

European provinces with high levels of fatal alcohol poisoning rates tend to form a “belt” around Vladimir, Ivanovo and Vologda. The European high-binge-drinking zone spreads from the North towards the Northwest and the Central area and, finally, involves Ural – Sverdlovsk and Perm regions, as well as Udmurt Republic. The southern boundary of this zone lies, therefore, at the northern line of the Blackearth. The gradient of mortality dynamics tends to be directed towards the north for the European part of Russia.

2.4 “Good” and “bad” provinces – regional economic environment and population living standards

For all causes of death analysed, an enormous regional diversity of mortality patterns has been observed. There are evident zonal patterns in the spatial distribution of suicide, homicide and alcohol poisoning mortality:

- In general, the European part of Russia suffers more from alcohol-related mortality, as indicated by the wide spreading of high-binge-drinking zone. High-suicide and high-homicide zones cover smaller territories in the European part of the country.
For homicides, the emphasis is shifted towards the non-European provinces, with the Southern Siberian regions demonstrating the highest levels of mortality. High-binge-drinking zone occupies only the third place by coverage of the non-European territories.

The spatial distribution of high-suicide zone exhibits some similarity with that of heavy binge drinking for the European provinces, whereas in the Asian part of the country, it resembles high-homicide zone.

Sixteen regions exhibit high mortality for all analysed causes of death: Tver region, Republic of Karelia, Arkhangelsk region, Republics of Komi and Mariy El, Udmurt Republic, Perm and Sverdlovsk regions, Altai territory, Republic of Altai, Kemerov region, Republic of Tuva, Irkutsk, Chita, Amur and Sakhalin regions (listed from west to east).

On the other hand, there are groups of areas with predominantly low and stable death rates for all analysed causes. This list includes the regions of the North Caucasus, Central Blackearth, and some Povolzh'e provinces. Among the non-European regions, Republic of Sakha (Yakutia) can be considered to be the most favourable region.

### 2.4.1 European high-binge-drinking zone

This zone includes mostly old-industrialised, urbanised areas with predominantly Slavic populations. The basic regional characteristics have been compiled from Granberg (2004), Lagutenko (2001), Gokhberg (2002), GOSKOMSTAT (2002), TACIS (1996) and Weißenburger (1995). In sum, the regional environment can be described for this zone as follows:

- Light and machine building/defence industries dominated in the economic structure prior to the socioeconomic transition.

  These branches were heavily hit by the transition-related economic crisis. After the liberalisation of foreign trade, domestic light industry products failed to compete with imported goods; and the output in this sector fell by nearly 75% between 1989 and 1994. Converting defence industry to a civilian production – as well as a substantial cutback of governmental orders for aircraft / ship-building etc – caused a drastic output decline. Alone in 1994, production in machinery dropped by 38.1%, between 1989 and 1994 – by 60% (Weißenburger 1995). These figures mirror the situation in the respective branches for the whole county.

- During the transition period, there were relatively small changes in the regional economic structure.

- The regions were affected by a considerable production falling-off during the transition time.

  GOSKOMSTAT provides the volume index of industrial production, which can be used in order to estimate the extent of this crisis. The volume index of industrial production – calculated in comparable prices – refers to a comparable goods assortment structure: the higher this index for a given year, as compared to an initial period, the smaller the production falling-off. Although this index has definite limitations – such as coverage of predominantly large and medium size enterprises, underestimation of the “shadow economy” production – there is no alternative for this indicator in the regional studies.

  Between 1990 and 1999, the average Russian volume of industrial production declined by 50 percent. Our calculations, based on GOSKOMSTAT (2002) data, indicate a cata-
clysmic extent of this crisis for some areas within the European high-binge-drinking zone. In Kaliningrad region, industry produced in 1999 only 29 percent of its baseline’s value, registered for 1990. The respective figure for Bryansk region slightly exceeds 30 percent. For Penza oblast’, it amounts to approximately 36 percent; for Kostroma and Tver regions – less than 40 percent.

- Unemployment rates are high, as compared to the Russian average.

Here are some examples of unemployment rates for 1998 based on the ILO methodology (author’s calculations):

- Republic of Komi 17.6%
- Penza region 17.3%
- Kaliningrad region 16.8%
- Republic of Karelia 16.6%
- Russian Federation 13.3%

- Purchasing capacity of the population is relatively low due to widening discrepancies between growing consumer prices and the real available per capita income.

- Effective agricultural activities – personal subsidiary plots/holdings – are limited in the northern regions due to unfavourable climatic conditions.

  Given the low real available income, personal subsidiary plots/holdings represented one of the basic mechanisms of the population’s adjustment to the consumer prices development, both in rural and urban areas.

2.4.2 Non-European high-homicide zone

Below we summarize the general characteristics of the regional environment in this zone (Granberg 2004; Lagutenko 2001; Gokhberg 2002; GOSKOMSTAT 2002; TACIS 1996):

- In the majority of the non-European high-homicide provinces, there was a less substantial decline in industrial output, as compared to the European areas of Russia.

  Some noteworthy exceptions refer to the regions of Ural and Western Siberia with a pre-transitional preponderance of machine building/defence industry. For instance, in Altai territory, industrial production dropped by more than 60 percent between 1990 and 1999.

  For the “typical” provinces within this zone, our calculations show the regional industries in 1999 producing more than half of what they produced nine years earlier, on the eve of the transition (computed with GOSKOMSTAT 2002 data):

  - Krasnoyarsk territory 62.1%
  - Tyumen region 61.8%
  - Kemerov region 57.9%
  - Republic of Buryatia 56.8%

- The regional economic structure experienced significant changes in favour of extractive – first of all, gas and oil – industry and mining, ferrous and non-ferrous metallurgy. The most striking examples are Tyumen, Kemerov, Irkutsk and Krasnoyarsk regions.

- The figures of the officially registered unemployment were lower than in the European Russia. However, “hidden unemployment” was high in the Southern Siberian provinces.

- Climatic conditions are mostly unfavourable for the effective agricultural activities.

- The real available per capita income of the population differs for different provinces.
2.4.3 Outlier – Republic of Tuva

Among the non-European provinces, Republic of Tuva constitutes a very special case due to extremely high mortality rates for all causes of death analysed; its homicide rates are the highest in the country. In the regional economics literature, Tuva is often labelled as “retarded” or “less developed” republic (Zubarevich 2000; Granberg 2004 p322-326). It became a legal entity of the USSR in 1944. Tuva is one of the least urbanised provinces of Russia, with approximately 52 percent of the population living in rural areas. Other important features are listed below (TACIS 1996; Zubarevich 2000; Lagutenko 2001).

- The production drop – as estimated by TACIS (1996) – was relatively small between 1992 and 1995. This conclusion contradicts to our results, obtained for the extended period of time. In 1999, Tuva’s volume of industrial production was only 36 percent of the baseline’s value, well below the Russian average.
- The average salary for 1998 was approximately as high as the official level of poverty, defined as a “subsistence minimum”.
- Nominal per capita income in 1998 was even lower than the “subsistence minimum”.
- “Thin” wages and salaries have been paid less and less regularly: for 1998, the delays in wage payments lasted 4 months.
- Thus, the real available income of the population was extremely low.
- Finally, severe climatic conditions did not contribute to effective substitutive agricultural activities (personal subsidiary plots/holdings). The average air temperature in January is minus 25-35° C, in July – only plus 15-20° C.

2.4.4 Other Southern Siberian provinces

The high-mortality “problem regions” of Irkutsk, Chita, Kemerov, Altai territory and Republic of Altai show a lot of similarity with respect to transitional developments in their economic structure (Gokhberg 2002 p264-310; TACIS 1996). Defence industry/machine building or coal mining dominated in the pre-transitional economic structure of these provinces. The subsequent major decline in production of these branches caused a severe economic crisis, which was partly levelled-out in Kemerov and Irkutsk regions due to the favourable branch of metallurgy. At the same time, these provinces have been forced to alter their economic structure.

The inhabitants of the formerly wealthy provinces have been faced with a drastic decline in their living standards (Zubarevich 2000):

- In Chita region, nominal per capita income dropped below the “subsistence minimum” mark in 1998; a very similar situation was observed in Altai territory and Republic of Altai, where nominal per capita income just slightly exceeded this mark.
- In Kemerov region, the delays in wage payments lasted 4 months in 1998.
- Consumer prices for 1992-1994 exceeded the Russian average level by 10-20% in Kemerov region. They were even higher in Irkutsk and Chita regions.

Living standards of the population did not decline as much in other Siberian regions, where favourable fuel – oil and gas – industry or mining – e.g., gold and diamonds – dominated in the pre-transitional economic structure. In Omsk region, fuel industry kept its key position and provided about 50 percent of the regional production in 1997. The oblast’s patterns of mortality are characterised by middle levels and moderate or low fluctuations of death rates.
2.4.5 Ural
Considerable changes of the economic structure affected Ural provinces, where high levels and high/moderate fluctuations of mortality rates have been recorded during the transition time. The Soviet defence industry/machine building enterprises have been historically concentrated in the Ural economic region (Lagutenko 2001 p226). Therefore, some of the Ural provinces experienced a drastic decline of industrial output during the transition period (Granberg 2004 p319). For instance, volume of industrial production – expressed as a percent of the baseline's value for 1990 – amounted in 1999 (author’s calculations based on GOSKOMSTAT (2002) data):

<table>
<thead>
<tr>
<th>Province</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sverdlovsk region</td>
<td>37.3%</td>
</tr>
<tr>
<td>Udmurt Republic</td>
<td>41%</td>
</tr>
</tbody>
</table>

Both officially registered and hidden unemployment figures were high in the Ural provinces (GOSKOMSTAT 1999; Zubarevich 2000). As to the income polarisation and real available per capita income, Ural provinces are close to the Russian average level. Finally, climatic conditions do not contribute to effective “substitutive agricultural activities”.

2.4.6 Sakhalin region
Among the non-European “bad provinces”, Sakhalin region should be discussed. As a Far Eastern frontier of the Russian Federation, Sakhalin plays a strategically significant role, concentrating military units, like its Far Western counterpart – Kaliningrad region.

During the transition time, Sakhalin inhabitants experienced a dramatic decline in their living standards. This refers, first of all, to military servants and their families. Rapid income fall, high consumer prices, irregular payments of wages and salaries resulted in lowering purchasing capacity of the population. These difficulties forced people to leave Sakhalin and to migrate to more favourable provinces. Massive population outflow characterises Sakhalin in transition (Gokhberg 2002 p315-318).

2.4.7 Provinces of the European South
We identified some “good” provinces of the European South with low death rates. These provinces can be subdivided into two distinct groups: poor ethnic republics of the North Caucasus and relatively wealthy Russian-dominated southern oblast’s and territories.

The wealthier group includes the predominantly Slavic regions of the North Caucasus – Rostov oblast’, Krasnodar and Stavropol territories – as well as the Central Blackearth and some Povolzh’e provinces.

In this group, the pre-transitional economic structure was mostly “favourable”. Thus, Belgorod and Lipetsk oblast’s had a well-developed metallurgy. The proportion of defence industry/machine building in the economic structure was relatively low, except for Rostov region. Other characteristic features of the regional environment include:

- low or moderate decrease in production during the transition time,
- predominantly small changes of the economic structure,
- low unemployment rates,
- beneficial climatic conditions for effective agricultural activities, i.e. personal subsidiary plots/holdings and
- high or middle-high real available income of the population (Granberg 2004 p280).
In the poor ethnic republics of the North Caucasus, almost every major parameter of the regional environment is fundamentally different from the parameters mentioned above for the Russian-dominated provinces. Some of these republics — e.g., Kabardian-Balkar, Karachaev-Circassian, North Ossetia and Dagestan — are regarded by the economists as “retarded” or “less developed” (Granberg 2004 p322-323). The big proportion of non-Slavic ethnic groups seems to correspond with generally negative attitudes towards heavy binge drinking in the population. Indeed, our findings point out to the extremely low regional levels of fatal alcohol poisoning rates.

Other distinctive features of the republics’ regional environment are:

- relatively low urbanisation degree,
- political instability due to ethnic conflicts,
- poorly developed industry,
- drastic decline of production during the transition time,
- very high unemployment,
- minimal changes of the economic structure and
- extremely low real available income of the population.

This information has been compiled from the papers of Zubarevich (2000), Lagutenko (2001), Gokhberg (2002 p131-162) and Granberg (2004 p319).

### 2.4.8 Major cities and Murmansk region

Among the “good regions”, there are the major cities — Moscow and St. Petersburg — and Murmansk region. These “subjects of the Russian Federation” show low/middle levels and predominantly high variability of death rates.

The heterogeneity of economic structure contributed to a compensatory development in branches beyond the crisis-affected machine building/defence industry. In Moscow, there was a significant decline of industrial output during the initial transition time (1992-1995), whereas construction, services, governmental sector and banking/financial sector developed rapidly. In St. Petersburg, decline in industrial production was comparable to the Russian average level; in Murmansk region it was small (van Selm 1998).

The nominal per capita income of the population was high in these “federation subjects”. Consumer prices exceeded the average country’s level by more than 20% in Moscow and in Murmansk region; in St. Petersburg, they were quite comparable with the Russian average level. The real available income of the population was high in Moscow, St. Petersburg and Murmansk region. Low officially registered unemployment and relatively low “hidden unemployment” characterised the labour market situation. As for income inequalities, St. Petersburg belonged to the regions with extreme differences between the highest and the lowest income quintiles in 1994 (approximately 32 times); Moscow demonstrated high income inequalities (20-25-fold differences between the “poorest” and the “richest” quintiles). Low degree of income inequalities was estimated for Murmansk region with 7-8-fold differences (TACIS 1996).
Table 2-4 List of administrative areas by economic regions

<table>
<thead>
<tr>
<th>NAMES USED</th>
<th>TRANSCRIPTION OF ORIGINAL NAMES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Central economic region</strong></td>
<td>Tsentral'nyi ekonomicheskii raion</td>
</tr>
<tr>
<td>Bryansk region</td>
<td>Bryanskaya oblast'</td>
</tr>
<tr>
<td>Ivanovo region</td>
<td>Ivanovskaya oblast'</td>
</tr>
<tr>
<td>Kaluga region</td>
<td>Kaluzhskaya oblast'</td>
</tr>
<tr>
<td>Kostroma region</td>
<td>Kostromskaya oblast'</td>
</tr>
<tr>
<td>Moscow</td>
<td>Moskva</td>
</tr>
<tr>
<td>Moscow region</td>
<td>Moskovskaya oblast'</td>
</tr>
<tr>
<td>Oryol region</td>
<td>Orlovskaya oblast'</td>
</tr>
<tr>
<td>Ryazan region</td>
<td>Ryazanskaya oblast'</td>
</tr>
<tr>
<td>Smolensk region</td>
<td>Smolenskaya oblast'</td>
</tr>
<tr>
<td>Tula region</td>
<td>Tul'skaya oblast'</td>
</tr>
<tr>
<td>Tver region</td>
<td>Tverskaya oblast'</td>
</tr>
<tr>
<td>Vladimir region</td>
<td>Vladimirskaya oblast'</td>
</tr>
<tr>
<td>Yaroslavl region</td>
<td>Yaroslavskaya oblast'</td>
</tr>
<tr>
<td><strong>Central Blackearth economic region</strong></td>
<td>Tsentral'no-Chernozemnyi ekonomicheskii raion</td>
</tr>
<tr>
<td>Belgorod region</td>
<td>Belgorodskaya oblast'</td>
</tr>
<tr>
<td>Kursk region</td>
<td>Kurskaya oblast'</td>
</tr>
<tr>
<td>Lipetsk region</td>
<td>Lipetskaya oblast'</td>
</tr>
<tr>
<td>Tambov region</td>
<td>Tambovskaya oblast'</td>
</tr>
<tr>
<td>Voronezh region</td>
<td>Voronezhskaya oblast'</td>
</tr>
<tr>
<td><strong>North-Western economic region</strong></td>
<td>Severo-Zapadnyi ekonomicheskii raion</td>
</tr>
<tr>
<td>Leningrad region</td>
<td>Leningradskaya oblast'</td>
</tr>
<tr>
<td>Novgorod region</td>
<td>Novgorodskaya oblast'</td>
</tr>
<tr>
<td>Pskov region</td>
<td>Pskovskaya oblast'</td>
</tr>
<tr>
<td>St. Petersburg</td>
<td>Sankt-Peterburg</td>
</tr>
<tr>
<td><strong>Northern economic region</strong></td>
<td>Severnyi ekonomicheskii raion</td>
</tr>
<tr>
<td>Arkhangelsk region</td>
<td>Arkhangel'skaya oblast'</td>
</tr>
<tr>
<td>Murmansk region</td>
<td>Murmanskaya oblast'</td>
</tr>
<tr>
<td>Republic of Karelia</td>
<td>Respublika Kareliya</td>
</tr>
<tr>
<td>Republic of Komi</td>
<td>Respublika Komi</td>
</tr>
<tr>
<td>Vologda region</td>
<td>Vologodskaya oblast'</td>
</tr>
<tr>
<td><strong>Volga-Vyatka economic region</strong></td>
<td>Volgo-Vyatskii ekonomicheskii raion</td>
</tr>
<tr>
<td>Chuvash Republic</td>
<td>Chuvashskaya Respublika</td>
</tr>
<tr>
<td>Kirov region</td>
<td>Kirovskaya oblast'</td>
</tr>
<tr>
<td>Nizhny Novgorod region</td>
<td>Nizhegorodskaya oblast'</td>
</tr>
<tr>
<td>Republic of Mariy El</td>
<td>Respublika Mari El</td>
</tr>
<tr>
<td>Republic of Mordovia</td>
<td>Respublika Mordoviya</td>
</tr>
<tr>
<td><strong>Povolzh'e ekonomic region</strong></td>
<td>Volzhskii ekonomicheskii raion</td>
</tr>
<tr>
<td>Astrakhan region</td>
<td>Astrakhanskaya oblast'</td>
</tr>
<tr>
<td>Penza region</td>
<td>Penzenskaya oblast'</td>
</tr>
<tr>
<td>Republic of Kalmykia</td>
<td>Respublika Kalmykiya</td>
</tr>
<tr>
<td>Republic of Tatarstan</td>
<td>Respublika Tatarstan</td>
</tr>
<tr>
<td>Samara region</td>
<td>Samarskaya oblast'</td>
</tr>
<tr>
<td>Saratov region</td>
<td>Saratovskaya oblast'</td>
</tr>
<tr>
<td>Ulyanovsk region</td>
<td>Ul'yanovskaya oblast'</td>
</tr>
<tr>
<td>Volgograd region</td>
<td>Volgogradskaya oblast'</td>
</tr>
</tbody>
</table>

7 If NAMES USED are not indicated, the regions are omitted (not analysed) in this paper.

- 43 -
### Spatial Aspects of Mortality

<table>
<thead>
<tr>
<th>North-Caucasus economic region</th>
<th>Severo-Kavkazskii ekonomicheskii raion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kabardian-Balkar Republic</td>
<td>Kabardino-Balkarskaya Respublika</td>
</tr>
<tr>
<td>Karachaevo-Circassian</td>
<td>Karachaevo-Cherkesskaya Respublika</td>
</tr>
<tr>
<td>Krasnodar territory</td>
<td>Krasnodarski krai</td>
</tr>
<tr>
<td>Republic of Adygea</td>
<td>Respublika Adygea</td>
</tr>
<tr>
<td>Republic of Dagestan</td>
<td>Respublika Dagestan</td>
</tr>
<tr>
<td>Republic of North Ossetia</td>
<td>Respublika Severnaya Ossetiya</td>
</tr>
<tr>
<td>Rostov region</td>
<td>Rostovskaya oblast'</td>
</tr>
<tr>
<td>Stavropol territory</td>
<td>Stavropolski krai</td>
</tr>
<tr>
<td></td>
<td>Ingushskaya Respublika</td>
</tr>
<tr>
<td></td>
<td>Chechenskaya Respublika (Chechnya)</td>
</tr>
<tr>
<td><strong>Ural economic region</strong></td>
<td></td>
</tr>
<tr>
<td>Chelyabinsk region</td>
<td></td>
</tr>
<tr>
<td>Kurgan region</td>
<td></td>
</tr>
<tr>
<td>Orenburg region</td>
<td></td>
</tr>
<tr>
<td>Perm region</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Republic of Bashkortostan</td>
<td></td>
</tr>
<tr>
<td>Sverdlovsk region</td>
<td></td>
</tr>
<tr>
<td>Udmurt republic</td>
<td></td>
</tr>
<tr>
<td><strong>Western Siberian economic region</strong></td>
<td></td>
</tr>
<tr>
<td>Altai territory</td>
<td></td>
</tr>
<tr>
<td>Kemerovo region</td>
<td></td>
</tr>
<tr>
<td>Novosibirsk region</td>
<td></td>
</tr>
<tr>
<td>Omsk region</td>
<td></td>
</tr>
<tr>
<td>Republic of Altai</td>
<td></td>
</tr>
<tr>
<td>Tomsk region</td>
<td></td>
</tr>
<tr>
<td>Tyumen region</td>
<td></td>
</tr>
<tr>
<td><strong>Eastern Siberian economic region</strong></td>
<td></td>
</tr>
<tr>
<td>Chita region</td>
<td></td>
</tr>
<tr>
<td>Irkutsk region</td>
<td></td>
</tr>
<tr>
<td>Krasnoyarsk territory</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Republic of Buryatia</td>
<td></td>
</tr>
<tr>
<td>Republic of Khakasia</td>
<td></td>
</tr>
<tr>
<td>Republic of Tuva</td>
<td></td>
</tr>
<tr>
<td><strong>Far East economic region</strong></td>
<td></td>
</tr>
<tr>
<td>Amur region</td>
<td></td>
</tr>
<tr>
<td>Jewish autonomous region</td>
<td></td>
</tr>
<tr>
<td>Kamchatka region</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Khabarovsk territory</td>
<td></td>
</tr>
<tr>
<td>Magadan region</td>
<td></td>
</tr>
<tr>
<td>Primorsky territory</td>
<td></td>
</tr>
<tr>
<td>Republic of Sakha (Yakutia)</td>
<td></td>
</tr>
<tr>
<td>Sakhalin region</td>
<td></td>
</tr>
<tr>
<td><strong>Kaliningrad region</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Compiled from Lagutenko (2001 p202-237)
2.5 Concluding remarks

We have identified groups and zones of high- and low-mortality provinces. It is quite evident that these zones have common characteristics of the population living standards, economic structure and performance, labour market situation, climatic conditions etc.

First, the highest mortality rates have been observed in the provinces with low living standards, assessed in the reviewed papers as real per capita income. In the low-mortality regions – except for the poor ethnic republics of the North Caucasus – there is a relatively high real income of the population.

Second, “economically depressed” provinces with the deepest industrial decline during the transition period exhibited high mortality rates – first of all, due to suicides and fatal alcohol poisonings. For the whole Russia, the average extent of this decline has been found to far exceed that of the drop in U.S. output during the Great Depression (Gregory & Stuart 1998 p337).

The Russian economic crisis has particularly affected light industry and machine building/defence industry. The “depressed” old-industrialised regions with high unemployment rates had a considerable proportion of these branches in their economic structure. These peculiarities of the economic structure did not evolve during the socioeconomic transition; they are deeply rooted in the administrative command economy and the Soviet planning system. An excess industrial specialisation of areas, concentration of production in “mono-specialised” cities and towns – these features were typical for the spatial organisation of the Soviet military-industrial / defence establishments (Granberg 2004 p255).

Third, some of the Siberian high-mortality regions experienced rapid structural changes in favour of extractive industries. The Russian economists believe such changes to be regressive, since the regional economic structure resembles that of the developing countries with a raw material export orientation (Granberg 2004 p273). In some of the “federation subjects” with low mortality rates – e.g., Moscow, St. Petersburg – the economic structure became more “Westernised”. The “Westernisation” means substantial increases in the shares of trade, financial services and personal services – all of which are in greater demand in a market economy (Gregory & Stuart 1998 p333). Generally, expanding sectors of trade and services – and the respective shift of labour resources from industrial branches to trade and services – represent a very important trend in the Russian economy of 1990s. These structural changes are accompanied by the growing income polarisation.

Fourth, many of the high-mortality provinces are characterised by higher than average consumer prices. The hyperinflation of 1992-1993 – caused by the “shock therapy” – absorbed the greatest part of private savings of Russian citizens; it was associated with a sharp fall of the purchasing capacity of the population.

Fifth, the hyperinflation did not equally affect all parts of the country – it seems to be higher in the regions with a severe climate. Favourable climatic conditions may “protect” a province from higher inflation rates. If the foodstuff demand of inhabitants can be satisfied without resorting to products imported from abroad or from other regions, the food prices remain low. Vice versa, severe climatic conditions – e.g., eternal frost, extremely cold winter temperatures, lacking insolation and precipitation – hamper effective agricultural activities and personal subsidiary plots/holdings. Additional problems of the “cold regions” concern a very expensive transportation of products from more beneficial areas – due to far distances and poorly developed railway and road nets. Therefore, price levels may be substantially higher for all types of goods and products.
The evidence of higher mortality rates in the regions with a severe climate and higher consumer prices poses the following research questions: Is there an association of inflation and mortality rates? Does climate matter?

**Sixth**, a tentative conclusion can be made that low-mortality provinces are generally characterised by better parameters of the regional economic environment. Except for the ethnic republics of the North Caucasus, the low-mortality regions have wealthier inhabitants, less pronounced industrial decline, lower unemployment rates etc.

**Seventh**, the “less developed/retarded” ethnic republics of the North Caucasus represent the most mysterious group of Russian regions. Their low and stable violent mortality rates – despite enormous poverty of the inhabitants, political instability, ethnic conflicts etc – suggest that statistical data may not be reliable for these provinces. On the other hand, the “ethnic factor” may have protective effects on mortality.

**Eighth**, we discovered that high-binge-drinking zones partly overlap with high-suicide and high-homicide zones. Vice versa, many of the low-binge-drinking zones are characterised by the low suicide and homicide mortality levels. The spatial distribution patterns are particularly close for fatal alcohol poisonings and suicide mortality rates.

The descriptive evidence presented so far suggests that spatial patterns of violent and alcohol-related mortality can probably be explained by the combined effects of the regional environment characteristics, discussed in this chapter.

The literature on regional economics and the preliminary examination of the relevant official statistics data suggest a feasible approach to measuring potentially important determinants of violent and alcohol-related mortality in the given set of administrative areas.
CHAPTER 3 – CONCEPTUAL MODELS: (A) STRESS-RELATED MORTALITY
3.1 Introduction

As indicated above, there are some specific conditions of regional environment, which may correspond with low or elevated levels of mortality. We have also concluded that these potentially important determinants of mortality can be measured without creating complex, hardly interpretable indices of transition or stress. However, we did not touch upon the question of how these conditions affect the relevant mortality outcomes.

These issues are investigated in the given chapter:

– What are the basic causal pathways, by which regional conditions affect suicide and homicide mortality in transitional Russia?
– Are these pathways uniform for suicide and homicide mortality?

Essentially, we elaborate the two mainstream research hypotheses, suggesting an explanation of violent mortality epidemics in Russia – namely, transition-related stress and enormously high alcohol consumption in conjunction with dangerous drinking habits (heavy binge drinking).

The objectives of this chapter are as follows.

First, we create a conceptual multilevel framework – integrating biological, psychological, social and economic reasoning – for investigating the influence of transition-related stress factors and alcohol consumption on suicide and homicide. The basic assumption is that suicide and homicide are deviant behaviours resulting from an inappropriate coping with a stressful reality.

This conceptual approach can be legitimated by the second objective of this chapter, which is to guide the econometric analysis of suicide and homicide mortality. We develop a theoretical foundation for a non-arbitrary selection of explanatory variables in econometric models. The latter implies that (1) we are aware of the possible linking between stress and the determinant represented by a particular variable and (2) we understand how the given determinants can be measured at the population level.

The third objective refers to some measurement problems, which exist in transitional Russia. We consider the issues of reliability and meaning of traditional measures applied for unemployment and education, social cohesion/support etc.

3.2. What causes stress?

An epidemic increase of mortality due to “unnatural” – violent and accidental – causes of death has been observed during the period of the socio-economic transition in Russia. Two intriguing questions arise with respect to this phenomenon:

– Who do some people in the population commit suicide or homicide, whereas a part of this population shows no signs of mental or behavioural problems?
– How is human deviant behaviour related to the factors of material well-being?

From a psychological standpoint, all types of deviant behaviour – including suicide and homicide – can be viewed as consequences of an inappropriate stress management. In a very general form, stress – its onset, development and outcomes – can be illustrates as a sequence of schemes. First, consider onset of stress from social-psychological and psycho-physiological perspectives (Scheme 3-1).
This scheme illustrates some structural characteristics of the problem. Stress manifests when person/environment transactions lead the individual to perceive a discrepancy – whether real or not – between the demands of the situation and resources of the person's biological, psychological or social systems. The demands are mediated via the level of expectations, whereas resources are expressed by the place in reality.

In our multidimensional world, all people have different resources, which are not necessarily limited only by the material well-being. These resources include people's educational skills and natural abilities, social support, access to information etc. In general, our individual place (position) in reality is determined by our resources and abilities to use them. For the purposes of simplification, only material well-being is depicted. Indeed, its role is extremely important.

What does material well-being psychologically mean to people? If it were simply money, there would be no links between material income and wider functioning in the society, level of self-esteem and the respect of others, increased vulnerability and social exclusion (Lobmayer & Wilkinson 2002).

Many people equate money with power. A concrete material incarnation of power is a possession of social status symbols, associated with honour or prestige of their owners. Usually, status symbols are either visible by others or are easily talked about in social situations: stylish clothing, vacations, laptop computers, furniture, luxury cars, sports utility vehicles, last handy models, prestigious education for children, houses etc.

Many people equate money with financial security, i.e. with an ability to meet future needs while keeping pace with day-to-day obligations. This implicates making plans for mid- and long-term future – concerning investments in education for children, in immovable property, preparing for retirement etc.

Within this context, being poor means not only an absolute material deprivation as inability to meet basic expenses for food, water, housing and sanitation. To be poor means also to be re-
duced in opportunities of sustaining the lifestyle prevalent in a given society. This is a relative concept. Many people view their financial situation as desperate, despite basic needs are covered. The concept of relative material deprivation is closely linked with income inequality. A sharp increase in inequality may have dire effects on social stability, including violence and crime rates (Bourguignon 2001 p208–217; UNDP 2003 p39). Since 1989, the rise in inequalities – and in relative material deprivation – in the former egalitarian societies of NIS is perplexing. Russia has experienced a widening of its income distribution over one year equivalent in scale to that which occurred in the UK over ten years (Cornia & Kliski 2001 p6).

In the Soviet Union, the concept of poverty has never been used. Instead, it was referred to as “lack of material security”. Official estimates suggest that the proportion of the population below the so-called “subsistence level” – an equivalent of poverty level – grew dramatically from less than 10 percent in the late 1980s to over 30 percent during 1992 and 1993. After subsiding to around 20 percent, the poverty rate then climbed above 40 per cent following the August 1998 crisis (Kolenikov & Shorrocks 2003 p1). According to a survey of the All-Russian Public Opinion Research Centre (Ryvkina 2003), the distribution of self-estimated material well-being at the end of 2000 was as follows (percent of respondents):

- income is insufficient even to buy food 32%
- income is sufficient for buying food, but insufficient for clothing 43%
- income is sufficient for buying food and clothing, but insufficient for durables 21%
- can not buy articles of luxury 4%

As shown, 75 percent of the respondents believed that they did not have enough money for basic needs (food and clothing). Thus, the “place in reality” has significantly changed for many Russians during the past decades – both in terms of absolute and relative material deprivation.

Definite expectations correspond to people’s place in reality: e.g., how much do we expect to earn – or to be able to consume – in the nearest or mid-term future.

In psychological experiments – series of tasks of different complexity – expectations of individuals have been shown to vary: their level clearly depends on the individual experience. After successful solution of labyrinth tasks, mentally healthy probands select more difficult tasks, demonstrating increasing level of their expectations. A downward trend in expectations is observed after series of “no-solution tasks” (Zeigarnik 1986 p77-80).

On the other hand, our expectations are formed in competitive situations, when people compare their own achievements – place in reality – with those of their personal referent group: friends, (former) classmates, colleagues, neighbours etc. The higher is the socioeconomic status of a referent group, the higher are the expectations of a person. Mass-media and advertising play a very important role in the formation and sustaining of expectations levels. One can imagine the feelings of an ordinary citizen looking at huge shields along the street with the inscription “All successful people do this” (advertising of a luxurious immobile property in Moscow, September 2004).

Societal norms and values, traditional masculine or feminine roles can be considered as an integral part of the collective experience. They serve as regulation mechanisms for individual expectations. If men in working ages expect to overtake the main responsibility for the material well-being of their families – in accordance with the masculine roles in a patriarchal society – it becomes clear, why this population group was in a particularly demanding psychological situation during the last decades in Russia. Thus, in a generalised form, expectations can be mathematically described as a function of a person’s individual experience (in the past) and collective experience (at present and in the past):

\[
\text{Expectations of a person} = f \{\text{individual experience}; \text{collective experience}\}
\]
A discrepancy between expectations and reality induces an adjustment reaction, not necessarily involving purely pathological mechanisms – i.e. stress in the broad sense, a “General Adaptation Syndrome” (Selye 1982). Stress can surely have a positive role, mobilising resources and acting as a “driving force” of the personal development. It stimulates the achievemental motivation of individuals, especially in experimental situations with clearly stated goals and predictable time investments (Zeigarnik 1986 p88-89).

On the opposite, a real major distress – i.e. a pathological process disturbing the organism’s homeostasis – may manifest in an uncertainty situation, when goals are vitally important but unachievable, or means of for achievement are not clear or extremely hazardous. Of course, such situations can hardly be imitated under experimental conditions.

Russian socio-economic transition can be considered as a “natural experiment”, when large unanticipated economic changes, shifts in social hierarchies, breakdown of societal norms and values bring about distressing, threatening uncertainty for the overwhelming majority of the population.

Long before the stress theory has been developed, Durkheim suggested that suffering of people is increased, since they can not adjust quickly to new conditions arising from abrupt economic changes – both in financial disasters and during the periods of prosperity. He believed that people differ from other animals in that their desires often outstrip the means at their disposal for satisfying them. Economic disasters cast some people into lower statuses, in which they must restrain their desires still further and accept still fewer rewards. The increasing prosperity removes the limits on desires. Thus, the increasing suffering of populations results in growing anomic suicide mortality (Durkheim 1897).

3.2.1 Transition-related stressors

First of all, it is necessary to consider stressors – i.e. factors causing stress. From a psychological point of view, stressors act increasing a discrepancy between the expectations and reality – for instance, via drastic changes of this reality. Their subsequent pathways include several mechanisms (Krieger 2001): First, they may become directly pathogenic by affecting neuro-endocrine function. Second, they may alter susceptibility of “host-persons”. Third, they induce health-damaging behaviour – especially in relation to use of psychoactive substances. Finally, they modify the level of important health determinants which may act as amplifiers or attenuators of aggressive or auto-aggressive impulses (Plutchik & van Praag 1990 p58-62).

Since a direct stress measurement can hardly be performed at the population level, this paper focuses on the identification of transition-related stressors – or their proxy-variables – and the examination of their relationships with behavioural outcomes of stress. We believe that there are at least three groups of stressors, crucial for the Russian population within the time span analysed:

1. **Financial losses**

This group of stress factors deals with a dynamically developing material deprivation. It can be approximated, for instance, by private savings, which were virtually annihilated by inflation explosion in 1992: inflation peaked at more than 30 percent per month and then spurted again after the financial crisis in August 1998 (Kolenikov & Shorrocks 2003 p1).

2. **“Side-effects” of incomplete economic restructuring in unstable and insecure economic environment**

The second group of stressors relates to the break-up of the “old pathways”. It is directly associated with the changes of economic structure and development of complementary economic activities of the population. Different reasons force people to leave their old
working places in crisis-affected industrial branches: dissolved enterprises, inadequately low salaries, delays in payments, lasting for months etc. The former industrial workers look for new employment opportunities in trade and services; many people become self-employed. Multiple working places and odd jobs – including those in the “shadow economy” – become a “new reality” for an ordinary citizen in transitional Russia.

For the majority of former industrial workers these new (complementary) activities in trade and services are very unusual; they require a great deal of psychological flexibility, liability and readiness to risk. There are different risks, associated with these activities in the country with a transition to a market economy.

The beginner-businessmen are particularly at risk of financial losses due to lacking supply-demand estimates in a given market segment. Bureaucratic difficulties and corruption, heavy tax burden on business previous to taxation reform of 2001, unstable economic environment with an unpredictable inflation development, lacking bank credits for beginner-businessmen, insufficient legal security regulation for business activities – all these problems cause business in Russia to be an expensive and risky affair.

This affair requires for start investments many times exceeding profit in an early phase of a business establishment. A more serious problem arise in force-majeur situations: due to insufficient legal regulations, there is a widespread method of an informal enforcement for debts payment. This informal enforcement works by means of intimidations, arsons, kidnappings. Even premeditated murder – i.e. “contract killing” – of insolvent debtors can be used. Similar methods may be applied for the purposes of competitors dislodging.

Therefore, businessmen in Russia are at risk to lose their mobile and immobile property – sometimes their lives, although contract killings do not constitute a big proportion in the homicide statistics. Of course, the matter of economic risks will not rest here. These risks are especially high during the process of division of influence spheres in the new markets. Probably, this process has different tempo in different groups of regions. Summarising this discussion, we assume that the development of new (complementary) economic activities in unstable and insecure economic environment with a weak infrastructure may be associated with considerable risks for the population.

3. Elevated magnitude of transition-related problems in climatically disadvantaged areas

The third group of stressors deals with severe climatic conditions in many Russian provinces. Winter frost, summer heat, big seasonal and daily fluctuations of temperature and humidity, unstable weather in spring and autumn are typical for the majority of Russian territories.

In the provinces with extremely severe, hard or uncomfortable climate – like Eastern Siberia, arctic and sub-polar regions etc – there are generally higher costs of living and production. Prior to the socioeconomic transition, there were already 10-12 fold differences in living costs between the regions with comfortable and extremely severe climatic conditions (Prokhorov 1991 p112). Cold climate requires higher investments in social infrastructure, industry, railway and roads system, everyday amenities and health services. As discussed in the previous chapter, agricultural activities and personal subsidiary plots/holdings are ineffective; the foodstuffs demand of the population can only be covered with imported products. Far distances, poorly developed railway and road nets make any transportation of goods very expensive.

It is not surprising that the regions with severe climate were in particular affected by high inflation after the price liberalisation of 1992 and the breakdown of the economic relationships. In general, the population of these climatically disadvantaged regions experienced
the same aforementioned transition-related problems. However, their magnitude was probably incomparably elevated due to higher expenditures needed for the life sustaining. Arduous living conditions, excessive physical hardship in combination with higher living costs, accelerated by the inflation; created enormous stress for the population.

3.3 How does stress manifest?

Whatever causes stress, it is a very ancient and unspecific reaction to a threat. The body starts an involuntary sympathetic fight-or-flight response, preparing for combat or escape. On the psychological level, a distressed person feels anxiety, anger or fear. Being overwhelmed with excessive prolonged distress, people are focused on a short-term survival: their life becomes a series of short-term emergencies. In such cases burnout and exhaustion are inevitable.

An extreme form of the delayed and protracted stress response – a post-traumatic stress disorder – is observed after events of an exceptionally threatening or catastrophic nature, such as natural or man-made disaster, being the victim of torture, terrorism, rape or other crime etc. These events are likely to cause pervasive distress in almost anyone. Typical symptoms of a post-traumatic stress disorder include episodes of repeated reliving of the trauma in intrusive memories (“flashbacks”) or dreams, occurring against the persisting background of a sense of “numbness” and emotional blunting, detachment from other people, unresponsiveness to surroundings, anhedonia, and avoidance of activities and situations reminiscent of the trauma. Commonly, there is fear and avoidance of cues that remind the sufferer of the original trauma. Rarely, there may be dramatic, acute bursts of fear, panic or aggression, triggered by stimuli arousing a sudden recollection and/or re-enactment of the trauma or of the original reaction to it (WHO 1992: ICD-10).

In non-extreme cases, there are fine individual differences in the level of stress response. One person's “traumatic stressful event” may be another's meaningful experience or even exhilarating challenge. Some people have increased stress vulnerability. Predisposing psychobiological factors may include definite personality traits (compulsive, asthenic etc), previous history of neurotic illness or brain trauma. However, these factors are neither necessary nor sufficient to explain individual differences in stress-related outcomes.


1. The Alarm Reaction is equivalent to a fight-or-flight response and includes the various neurological and physiological responses when confronted with a stressor. When a threat is perceived, the hypothalamus signals both the sympathetic nervous system and the pituitary. The sympathetic nervous system stimulates the adrenal glands. The adrenal glands release corticosteroids to increase metabolism, which provides immediate energy. The pituitary gland releases adrenocorticotropic hormone (ACTH), which also affects the adrenal glands. The adrenal glands then release epinephrine and norepinephrine, which prolongs the fight-or-flight response.

2. The Stage of Resistance is a continued state of arousal. If the stressful situation is prolonged, the high level of hormones during the resistance phase may upset homeostasis and harm internal organs leaving the organism vulnerable to disease. There is evidence from animal research that the adrenal glands actually increase in size during the resistance stage, which may reflect the prolonged activity.

3. The Exhaustion stage occurs after prolonged resistance. During this stage, the body's energy reserves are finally exhausted and breakdown occurs.
In a case of distress, these neuro-endocrine reactions are associated with psychological symptoms, which may determine behavioural patterns.

In Alarm, the consciousness of a distressed person is focussed on exaggerated fear. Fear relates to something that could produce harm or loss – but not yet produced. People tend to perceive their environment as a possible threat to their survival. Pain perception diminishes. Alarm bypasses rational mind and moves the distressed person into “attack mode”, when everybody and everything is tended to be seen as a potential enemy. Like airport security during a terrorist threat, distressed people are on the look for every possible danger. Thinking is distorted, making clear choices and recognising consequences of these choices is unfeasible. Thus, people may run excessive risks in this state of “narrowed consciousness”. Violence right up to non-premeditated homicide is the extreme expression of this state.

In Exhaustion, when bodily resources waste away, fight becomes impossible. Instead, people tend to develop “escape strategies”. Hypothetically, non-impulsive suicide may be viewed as an extreme form of “escape” (Gilinsky 1997; Baumeister 1990). Suicide victims have neither energetic reserves, nor motivation to struggle for life; they see no alternative way out from hard circumstances generated by stressful life events, serious illness or disability-related helplessness. As expressed in suicide notes (Northern Ireland Suicide Study), “life too much to bear”, “nothing to live for” (Foster 2003).

Therefore, in line with Selye’s concept, we assume that non-impulsive suicide and non-premeditated homicide manifest at different stress stages. The concept of Selye has been taken as a basis for our models of behavioural stress outcomes, since there is a large body of experimental evidence – both in humans and in animals – of a phase-wise psycho-endocrine stress response.

### 3.4 Successful coping versus counterproductive stress response

The ability to withstand the stress and to remain healthy is called resilience to stress (Lutha & Cicchetti 2000). Most people respond to stress by managing, by showing resilience. The salutogenetic model suggests that people have a variety of resources – General Resistance Resources – which can help them to perceive the world as an organised and structured reality. These resources represent both the internal capacity and motivation to cope with stress, as well as the external possibility to use own skills (Koposov et al 2003).

The salutogenetic model is closely related to the sense-of-coherence concept. Antonovsky (1987) defined sense of coherence as the global orientation that the world is comprehensible, manageable and meaningful. It means that:

- life makes sense and the information about it is structured and consistent;
- there are sufficient resources for dealing with life events and
- the situation is appraised as challenging and worthy of making commitments to cope with it.

The sense of coherence is considered to be the core of the human information processing – i.e. cognition – in resolving conflicts and stress management. This disposition develops with age, becomes relatively stable in early-mid adolescence and attains full stability by the end of the third decade of life.

In the classical psychology there is a term “coping” to characterise the process of stress management. Coping has been defined as efforts – cognitive or behavioural – used to overcome, tolerate, and/or reduce demands, which exceed our personal resources (Cohen & Lazarus 1979).
Ideally, appropriate coping (Scheme 3-2) mobilises our resources and provides our successful adjustment to a “new reality”.

Scheme 3-2 Optimal coping: convergence of expectations and reality

If it is the matter of material reality, the adjustment may either take a course to an improvement of this reality – e.g., through a new job/business with a better income (“businessman way”) – or may go on through changing perceptions of reality (“Buddha’s way”). The last coping strategy is combined with lowering of material expectations at a more or less stable “reality” level. Indeed, in the case of a “businessman way” expectations may grow. However, “reality” grows faster. In the both ways, there is a convergence of expectations and reality.

During the period of the socioeconomic transition, various strategies have been used by the Russian people to cope with economic hardship. For instance, an increase in home production by means of substitutive agricultural activities – personal subsidiary plots/holdings – could significantly reduce food expenditures of households. Other common strategies included finding supplementary jobs, renting out apartments, seeking help from friends and relatives – or just cutting expenditures for clothing and durables (Lokshin & Yemtsov 2001).

A counterproductive stress response leads to somatic diseases, mental illness or deviant behaviour – for instance, suicide or homicide. This happens if coping mechanisms are inappropriate (Scheme 3-3).

Poor coping is closely linked with factors of stress vulnerability, which settle on the way of using different resources available. Stress vulnerability may depend on biological characteristics, personality traits or mental health status. Thus, mental illness or maladaptive personality traits may considerably reduce internal capability or motivation to cope with stress. Biological characteristics – e.g., pre-retirement age – may reduce external possibilities to use qualification skills and professional experience – for instance, due to difficulties in finding an appropriated job during the period of unemployment.
These and many other factors – related to stress vulnerability and coping resources of individuals and populations – have been widely used in epidemiological studies as predictors of aggressive and auto-aggressive outcomes and “classical determinants” of violent mortality. Basically, they act as stress moderators.

**Scheme 3-3 Coping strategies and their consequences**

1. **Optimal Coping**
   - Convergence of Expectations & Reality
   - no health harm

2. **Lacking Coping**
   - Excessive Risk
   - Homicide

3. **Lacking Coping**
   - Lifestyle Changes; Homeostasis Upset
   - Chronic Conditions

4. **Lacking Coping**
   - Escape Strategy
   - Suicide

In order to examine relationships between the transition-related stressors and the outcomes of interest, a full-format picture of the empirical evidence is crucial. Therefore, we will integrate different stress moderators in our conceptual framework. Below, we will carefully review the well-known “classical determinants”. Since non-premeditated homicide is assumed to manifest in the first stage of stress, this review begins with homicide determinants.

### 3.5 Determinants of homicide mortality

Probably, increased stress vulnerability can lead to a breakdown of fragile coping mechanisms as early as in the Alarm stage of stress. Therefore, behavioural symptoms of Alarm – e.g., impulsivity, readiness to excessive risks, aggression and violence – may become more manifest in vulnerable persons. Consequently, there must be some common “markers” of the Alarm vulnerability in individuals committing non-premeditated violent crimes. These markers include definite personality traits, mental health problems, as well as age and gender characteristics.

#### 3.5.1 Personality traits

Psychological examination of those who committed non-premeditated homicide and assault identifies common persistent characteristics of their personalities. Actually, these personality traits “match” the perception modus of the Alarm stage like a lock and a key.
They include elevated anxiety, impulsivity, fixation on fears, aggressive tendencies, feeling of resentment towards society – brought about by failings, sexual frustrations and inability to be social or socially accepted (Apsche 1993).

Mistrustfulness and suspiciousness imbue the perception. Due to these stable traits, there is an inclination to see the whole environment and interpersonal relationships as potentially dangerous and hostile. All troubles may be taken as a result of somebody's unfriendly acts. Thus, an "attack for the sake of self-defence" may represent a hidden – unconscious – underlying psychological reason of many homicidal acts.

The exaggerated sense of "unfairness" – related to a "less worthy" person enjoying better pleasures, rights and opportunities – may result in a "homicide for fairness sake" – e.g., due to jealousy or revenge. Homicide for the purposes of a "fair" re-distribution of the victim's property takes place in many robbery cases (Antonyan 1997 p147).

### 3.5.2 Mental health problems

Brain trauma – e.g., commotion – or brain diseases in the childhood and adolescence are often anamnestically reported in medical records of violent criminal offenders. Even insignificant, brain damage may bring about mild signs of organic psycho syndrome, such as changes of character. Patients with organic psycho syndrome usually have increased emotional lability, irritability and aggressivity – or one will wait longer before they will show initiative ("sticking"). They can be more directed to themselves. In violent criminal offenders, the last feature may take an exaggerated form: self-interests and own intensified feelings are prior to the interests of a society. In addition, these character changes may be associated with thinking distortions and cognitive deficits.

There is a high prevalence of mental disorders among those who committed homicide. Antonyan (1997 p139) mentions the figure of 60 percent. The magnitude of these problems does not, however, allow for classifying these persons as criminally non-accountable for their acts. Nevertheless, socialisation process can be complicated even in mild cases of mental disorders.

The nature of relationships between personality traits, mental health problems, brain damage and violent tendencies is extremely complex. Obstetric complications which damage the nervous system at birth – combined with a subsequent parental neglect, as might occur in an alcoholic family – may predispose affected individuals to violence, crime, and other behavioural problems by age 18 (Raine et al 1994). On the other hand, children who only witness family violence may learn to imitate the roles of aggressors. Thus, alcohol abuse and violence may persist over generations (Brookoff et al 1997). These problems may be superior to a brain damage. Childhood victimisation in alcoholic families – associated with a brain damage – may cause a development of mental disorders with specific character changes. Taken together, these factors may determine a predisposition to the exaggerated Alarm reactions.

### 3.5.3 Age and gender

CRIMINALS: The majority of homicides are committed by men (90%) in the age group of 20-40 years (Antonyan 1997 p138). Criminologists mention age and gender as determinants of elevated stress susceptibility. Most likely, this susceptibility relates to the Alarm stage of stress. The typical social and psychological age- and gender-specific challenges refer to an increased necessity of social interactions and self-assertion in order to win a better position in life. Consequently, there is an accumulation of unpleasant emotional experiences and anxiety. In young men, intra- and interpersonal conflicts become more intense. A disillusion concerning own abilities, environment and life as a whole is also typical for people of these age groups. The psychological conflicts may force predisposed individuals to resort to "strong tough" measures.
VICTIMS: In Russia, the majority of homicide victims are men aged 20-59 years. The highest death rates are observed in the male age group 30-49 (Figure 3-1). In average, the male-to-female ratio is about 3.4 for the period 1990-2001. In female victims, there is another pattern of age distribution: it resembles an arched cat's back, with the most prominent part for the age groups 30-59, then mortality decreases to the age 60-69 and further grows up to 80 years and above (Figure 3-2).

Data source: GOSKOMSTAT / FAIRS (state: 2002)
The most frequent factors predisposing to homicide victimisation are: (1) aggressive or defiant behaviour of victims; (2) helplessness of victims due to mental illness/cognitive impairment, alcohol intoxication or old age; and, finally, (3) money- and property-related risks. In the majority of cases, old people become victims because of the following reasons: (1) they are murdered by their relatives-caregivers, who do not want to continue this high-cost and time consuming affair; (2) they are assaulted by those who want to seize their money or other valuables and (3) they are killed in the course of “play-of-manners” conflicts (Antonyan 1997 p172).

In general, the age- and gender-specific, biological and personality-related attributes discussed make people more susceptible to Alarm reactions. However, violent acts and homicide as a reaction to stress are not conceivable without additional determinants. These factors may play a role of triggers releasing aggressive impulses, amplifiers or attenuators. They are described below.

3.5.4 Alcohol consumption

Alcohol intake removes self-control restrictions, including those related to an inappropriate aggression. By impairing information processing, alcohol can also lead a person to misjudge social cues, thereby overreacting to a perceived threat (Miczek et al 1997). Simultaneously, a narrowing of attention may lead to an inaccurate assessment of the future risks of acting on an immediate violent impulse (Cook & Moore 1993 p193-212).

Alcohol may promote aggression because people expect it. In experiments with real and mock alcoholic beverages, test-persons who believe they have consumed alcohol begin to act more aggressively, regardless of which beverage they actually consumed (Bushman 1997).

80-90 percent of homicides are committed in the state of alcohol intoxication. The so-called “play-of-manners” killings – in which both victims and criminals are drunk – constitute the vast majority of homicides in Russia. Actually, these crimes occur mostly in socially disadvantaged population groups, in which violence is a usual communication and self-assertion style, and a well-accepted way of conflict solution. Antonyan (1997 p142) referred to a habitual drunkenness of these groups as to a special culture: “the bottle of vodka is a recognised measurement unit for material and spiritual well-being”. Most likely, it is a matter of substitution for the lacking well-being – whatever it concerns – rather than “measurement unit”.

In case of missing alternatives, alcohol represents probably the cheapest coping with the stressful reality. It brings about some relaxation, offsets the tedium of daily routines and censure pressure. The motive of drinking to avoid censure is encouraged by the popular view of intoxication as a “time-out,” during which one is not subject to the same rules of conduct as when sober (Zack & Vogel-Sprott 1997). This motive is in agreement with a wide-spread tolerance of drunken people in Russia: even defiant acts may be “absolved” if committed by a drunken. Pridemore (2004) refers to additional characteristics of Russian drinking behaviour, which are probably directly related to violence and homicide. Thus, drinking in private or semiprivate settings – homes and parks – is very common in Russia, because of poorly developed bar/pub culture. Private settings are associated with fewer formal controls – such as a bar bouncer who might respond quickly to break up a fight, or unrelated onlookers or a bar manager who may call the police if a disturbance erupts.

If the strain of frustration and anxiety can not be reduced otherwise, alcohol is the self-medication of choice. At the same time, alcohol stimulates communication activities. Therefore, alcohol consumption has a coping effect, when social resources and communication skills are limited. Shyness and diffidence can be relieved by alcohol intake. Being a part of the social functioning, alcohol provides confidence and self-respect feelings. Alcohol-related expectancies promote male
aggressiveness. They may increase self-respect of a drunken, if contribute to his self-perception of being a “strong man” among his peers. On the opposite, intoxicated women are usually seen as sexually perceptive and less able to defend themselves (Lang 1993 p121-148).

It is no mere chance that alcohol consumption transforms in a drinking culture with a great deal of rituals and moral prohibitions, even in individuals with pervasive antisocial attitudes towards norms and rights of others. A very special marginal group of violent criminal offenders – killers with habitual drunkenness – has been studied by Voloshina (1984, cited in Antonyan 1997 p142). The vast majority of these respondents saw nothing reprehensible in drinking of health-damaging alcohol surrogates in places where it is legally prohibited, without any snack. They found nothing blameworthy in using foul language and being heavily intoxicated in public places. However, they identified various moral prohibitions, internally established to protect the rights of companions in the course of emptying a bottle. Thus, one can not often take alcohol for somebody's expense or to fill his own glass with more “hard liquor” than a companion's glass. Appropriation of money raised for a joint alcohol session, or vodka bought for this money is not allowed. Any violation of these unwritten laws may cause brutal sanctions of the peer group – especially, in material need and increased requirements for alcohol. Therefore, an attempt to cope with a stressful reality in this way may result in a fatal outcome.

In summary, alcohol is widely used as the cheapest coping strategy – in order to reduce destructive emotional tensions or societal censure and to substitute lacking self-respect, social resources and communication skills. However, this coping may act as a “two-edged weapon”. Violent people with the increased Alarm vulnerability are more likely to be encouraged in heavy drinking. In turn, alcohol consumption may perpetuate violence. Therefore, it is to expect that alcohol consumption and violent crime rates – including the most brutal crimes like homicide – will grow along with increasing stress at the population level. Alcohol consumption or its proxy should be included in the econometric models of stress-related outcomes.

3.5.5 Crime

Crime – not necessarily violent – may act as amplifier of aggressive or auto-aggressive impulses (Plutchik & van Praag 1990) and is often discussed in the modern literature in connection with homicide and suicide (Simon et al 2002; Plutchik 1995). The results of the recent studies with individual-level data suggest that relationships between crime and some stress-related outcomes may be mediated by the sense of coherence.

A direct victimisation can potentially decrease an individual's sense of coherence (Koposov et al 2003) and reduce effective coping. The latter may result in increasing stress-related outcomes. Crime witnessing would lead to anxiety, as the individual does not suffer personally, but might expect a potential damage in the future.

How can we imagine the complex relationships between the transition-related stress, crime and the outcomes of interest? In general, crime is undoubtedly linked to the economic situation in Russia.

Radical economic reforms carried out without an adequate mechanism of control and protection from criminal encroachments create favourable conditions for an increase in crime rate – first of all, for different types of economic crimes. Wide availability of arms – not typical for Russia before – and lack of protection for property contribute to increasing rates of crimes against property – e.g., assaults related to robbery – and increasing violence of these crimes. The growing proportion of socially and economically disadvantaged population groups (Kolenikov & Shorrocks 2003) signifies that many people can not find an appropriate social niche for themselves in the new economic reality. Some of them take the criminal path. Approximately 72 percent of institutionalised criminals have committed crime for the first time (Vorozhtsov 1999).
Even those who did manage to find a new niche for themselves – for instance, as a successful businessman – cannot do without illegal dealings. Corruption, abuses of office and bribery are the main reasons for the criminalisation of society and the economy. The heads of police units interviewed within the framework of a criminological study in St. Petersburg stated: “The average businessman is extremely involved in crime…One has to bribe for everything…The debts have to be recovered by resorting to force…One cannot deal with taxation inspection without a bribe…” (Gilinskiy 2000 p9).

There is a maxim common both for the lumpenised criminals and the “average businessmen”: criminal activities provide an optimum of economic opportunities, which could never be achieved within the limits of the law. Therefore, the involvement in economic and property-related criminal activities can be considered as an attempt to cope directly with stress generated by economic difficulties. This behaviour may be quite rational for someone who is surviving from week to week in difficult circumstances.

Indirectly, economic crime “contributes” to a maladaptive coping of a significantly increased target group of alcohol and drug consumers. This happens via manufacturing and trafficking of narcotic drugs, illegal production and sale of alcohol products. Consequently, this criminal business is responsible for the growing drug-related violence and suicides, as well as for a considerable part of alcohol-related suicides and homicides.

Some forms of criminal behaviour are believed by the public to be socially permissible and even routine. Mass media play a certain role here, creating positive image of gangsters, propagandising violence, cruelty and criminal traditions. Criminal slang penetrated virtually all strata of society and mass media. Russian linguists conceptualise this phenomenon as a “criminalisation of language”, which testifies about “criminalisation of mind” (Kolin 1998; Sysoev 2002).

There is a growing consensus within the social sciences that exposure to violent media increases aggression, especially in youth (Uhlmann & Swanson 2004; Anderson et al 2003). The cognitive theories explain this association by factors related to information processing – i.e. observational learning and imitation of social behaviour. The likelihood that an individual will acquire an observed behaviour increases when:

- The model performing the behaviour is similar or attractive to viewer;
- There is identification with the model;
- The context is realistic;
- The viewed behaviour is followed by rewarding consequences.

When people watch a lot of violence, they do not longer respond with an unpleasant physiological arousal, normally associated with violence. However, repeatedly observed aggressive schemas stimulate the development of a permanent violence expectation, thereby increasing the likelihood of an aggressive response. These effects may become especially pronounced in disadvantaged populations, where media violence observed finds supportive stimuli in the individual victimisation experience. Moreover, a capacity for violence may become incorporated in a culturally acceptable masculine identity (Reilly et al 2004).

The growing legal nihilism of a certain part of the Russian population and the readiness to accept “permissible” forms of aggression have a negative influence on the criminal situation. From 1990 to 2001, crime rate rose by 65 percent (GOSKOMSTAT 2002). Other troublesome trends include a “rejuvenation” of criminals and an increase in serious crime (Vorozhtsov 1999). Crime became a serious problem in the public mind. According to survey results, the issue of protection from criminal encroachments occupies the second place on the scale of personal priorities of Russian citizens. Number one refers to the social and economic problems (Vorozhtsov 1999). When dealing with crime, the Russian society deals with the process of marginalisation, increasing so-
cial disruption and hostility. Therefore, crime rates should be taken into account in modelling stress-related outcomes.

3.5.6 Education

There is epidemiological evidence – both from aggregate-level (Najem et al 2004; Kawachi et al 1999) and individual-level studies (Madsen et al 2001) – that poor education is one of the most important determinants of homicide and violence. Education is considered within the conceptual frameworks of absolute deprivation (Kawachi et al 1999), human capital (Becker 1993) or social capital (Baron et al 2000). Together with occupation and income, it is one of the major components of the socioeconomic status. The level of education may probably show a good correlation with the overall knowledge of circumstances, which may increase the comprehensibility, manageability and meaningfulness of everyday life.

Educational level is supposed to be a good predictor of future wealth and social status. At the psychological level, people enjoying better education and a better social standing possess internal sources of pride and self-respect, as well as external sources of esteem from others. For these reasons, education is believed to be a very promising tertiary prevention of violence. Indeed, in some prison systems – Indiana, Massachusetts and Folsom Prison in California – achieving a college degree while in prison has proved to be successful in preventing recidivism among murderers and rapists for up to 25 years after discharge (Gilligan 2000).

Like in many other countries of Eastern Europe, the educational level of the population in Russia is fairly high. The adult population has more than 10 years of schooling in average, which is comparable to – or even higher than – corresponding statistics for the OECD countries. Between the last two population Censuses (1989-2002), the share of persons with secondary special and higher professional education increased 1.5fold (GOSKOMSTAT 2004).

However, the education-specific structure of the human capital does not match the requirements of a market economy. The centrally-planed educational system produced, say, too many highly qualified workers for the defence industry enterprises, and too few service and trade specialists. Therefore, with the beginning of the socio-economic transition, many people were forced to move to alternative occupations, in which their educational skills and training were inadequate. In many cases, loss of opportunities to use acquired skills made highly qualified specialists hesitant about switching occupations. This resulted in the increasing disproportion between the educational level, income and social standing. The predicting role of education for wealth and social status may be quite limited in Russia. Therefore, the concept of the socioeconomic status in its classical traditional understanding may need a substantial revision in order to be widely used in transitional countries.

It is important to understand that educational skills acquired may only be effectively transformed and improved – e.g., for switching to an equivalent occupation in a new branch – if there are sufficient external resources: access to information, internet, wide using of modern technique, funding sources etc. Thus, we can assume that education would show its visible health-protective effects in towns and cities with a developed infrastructure for lifelong learning. In aggregate-level studies with Russian data, this effect may be approximated by rate of graduate specialists with a university – or equivalent – degree.

3.5.7 Social cohesion / social support

Social cohesion refers to the extent of connectedness and solidarity among groups in society. As a collective dimension of society, it differs from other related concepts measured at the individual level – i.e. social networks and social support. Social cohesion may be described as:
• absence of latent social conflict implying various forms of societal polarisation, e.g., income/wealth inequality and
• presence of strong social bonds (Kawachi & Berkman 2000 p174-188).

Significant relationships between social cohesion and violence – including homicide – have been demonstrated in many studies. Shaw & McKay (1942) examined 21 U.S. cities and discovered that the same socio-economically disadvantaged areas continued to exhibit high delinquency rates – e.g., for homicide – over several decades, despite changes in their racial and ethnic composition. This observation led the authors to reject individualistic explanations of delinquency and violence and focus instead on community processes which led to the apparent trans-generational transmission of criminal behaviour. More recent criminological studies (Sampson et al 1997) revealed negative associations between the measures of social cohesion and variations in violence – adjusted for individual-level characteristics, measurement error and prior violence. Associations of concentrated disadvantage and residential instability with violence are largely mediated by the indicators of social cohesion.

Social support can be regarded as a totality of social resources that one can actually use as an assistance and encouragement in dealing with different life problems and stresses. Informal social support is usually provided by friends, family, relatives, neighbours etc, while formal assistance is provided by institutions, churches, groups etc.

Researchers have consistently found that individuals with lower levels of social support have substantially higher crime and deviance risks (Sampson & Laub 1990; Cohen et al 2003).

Social support and social cohesion should be considered within a concrete socio-economical context. A general model linking these contextual premises with social support/social cohesion and further with health outcomes has been developed by Berkman et al (2000). The authors envision a cascading causal reaction beginning from the macro-social conditions – embedding, for instance, politics, economic factors, social cohesion as a part of culture etc. A downstream movement leads to psychosocial (via social support), behavioural and biological (stress-related) processes affecting health. All processes within this causal chain are dynamically linked together.

Social support and social cohesion may have an effect on stress outcomes through some common mechanisms:

• influencing health-related behaviour, such as drinking, drug abuse etc;
• influencing access to information, money sources, services and amenities;
• affecting stress-reducing psychosocial processes – e.g., by providing emotional support and increasing self-esteem and mutual respect and
• affecting role functioning – by establishing/maintenance of harmonic or conflicting social roles.

Conflicting roles in separate social environments/groups cause stress development, whereas harmonic roles can be protective (Alemi et al 2003).

In line with these considerations, we assume that lower levels of stress-related mortality will probably be observed in populations with more stable and effective patterns of social cohesion/support. For instance, it may be true in patriarchal societies, where people are more likely to live in multigenerational households. The given household structure enables families to manage a lot of challenges – upbringing of children, caring for elderly, dealing with growing costs of living etc. In patriarchal societies, people are more likely to have clearly defined, traditional social roles. Stable relationships help to overcome any economic hardship. Family members going off in search of living remain connected with the core households with strong bonds. Similar patterns of relationships can also be generalised to neighbourhoods and communities.
In the Russian Federation, such patterns are typical for the cultures of the North Caucasus. There is a complex system of interfamily – between the relatives, within a clan – income redistribution, a considerable labour migration of mostly masculine population to other regions of the country, in order to earn living within the informal sectors of economy (ILO 2001 p118). In addition, there is a negative attitude to binge drinking and drunkenness in these cultures. Culture-specific aspects related to social cohesion/support should be taken into account in aggregate-level models of stress outcomes. We may try to approximate these effects by means of “ethnic composition of the regional populations”. More exactly, this proxy-variable should indicate a proportion of ethnic groups with better patterns of social cohesion/support assumed.

3.6 Determinants of suicide mortality

This section elucidates the most important determinants of suicide mortality and their links with stress. Let us remind that non-impulsive suicide is assumed to manifest in the Exhaustion stage – i.e. after a prolonged intensive distress, when bodily energetic resources waste away, and behavioural patterns of passivity and “escape” are very common.

3.6.1 Serious illness / mental disorders, disability and old age

From the standpoint of psychiatry, there is a linkage between stress, depression and suicide. However, the nature of these relationships is not yet definitively clarified. Stress often precedes psychiatric disorders – it is especially true for a certain group of mood disturbances. The crucial question with this respect is whether stress exhausts and destabilises basic psychological resistance mechanisms and neuronal systems in the brain to such an extent as to cause a mental illness, or should stress be considered as an epiphenomenon. Vaguely defined stress-related mental states are the major obstacles for a definite proof of a pathogenic causal role of stress (van Praag 2004).

Depression is a well-known risk factor for suicide. In particular, suicide mortality in major depression is about 20 times that of the general population (Ösby et al 2001). Any mental illness requiring hospital admission is recognised to be a significant suicide predictor. In the Danish population-based nested case-control study, the relative risk of suicide was 62.6 during admission and 6.51 within a year after discharge, compared to controls without any history of psychiatric disorders (Mortensen et al 2000).

However, epidemiological evidence suggests that severe psychiatric problems – including depressions – can only explain 30-50 percent of suicides (Möller et al 1996 p115-122). This fact testifies that suicide behaviour may not necessarily be caused by specific major mental disorders.

Biochemical and genetic explanations attribute suicidality to a diagnose-unspecific abnormality of serotonergic transmitter system, as measured by the hydroxyindoleacetic acid (HIAA) concentration in the cerebrospinal fluid (Möller 2003; Ahrens & Linden 1996). It is, however, unclear, whether these biological parameters are directly related to suicide. They may also reflect a general tendency to auto- and hetero-aggression or a predisposition to an impulsive behaviour.

There is one more suicide-related mystery: suicide and depression have their highest incidence/prevalence in different age groups. In the industrialised countries, completed suicides (not parasuicides!) are committed mostly by elderly people. By contrast, the prevalence of major depression is much lower in elderly population, than in younger people (Hybels & Blazer 2002 p603-628). Again, not all suicides can be linked with a depression! How can we explain relationships between old age and suicide, as well as depression and suicide? If we will ignore methodological
problems – like selection bias, inappropriateness of commonly used scales and schedules for the depression assessment in elderly probands – we can identify common characteristics of the states, which are treated as important suicide risk factors in the epidemiologic literature. They include old age, depression, severe prolonged physical or mental illness, comorbidity etc.

1. A profound fatigue and lack of energy is usually very prominent in depression. It is also a hallmark in severe disabling physical illnesses and old age. Increasing chronic pain – even in non-life-threatening diseases – is associated with physical and mental exhaustion (Gullacksen & Lidbeck 2004). People feel “tired, exhausted and week all the time”.

2. Quality of life may be considerably disrupted, since this fatigue is usually associated with anhedonia – i.e. with a reduced capacity to experience pleasure – and resulting lack of motivation. Basically, marked anhedonia can be a good predictor of poor survival chances in medical inpatients (Furlanetto et al 2000), regardless of the exact diagnosis.

3. In all these states, there is one more common feeling – profound and multiple losses related to health, relationships, financial security etc. This may represent a psychological reaction to a fatal, irremediable event.

With this view of things, suicide turns to be a diagnosis-unspecific phenomenon. It is even imaginable without any mental health problem, although the features described are incorporated in the depressive syndrome. Usually, the main preconditions are related to a combination of a prolonged intensive distress and losses. Additional factors which facilitate suicidal behaviour may be related to specific personality traits and reactions.

### 3.6.2 Personality traits and reactions

Personality reactions may trigger the manifestation of suicidal behaviour – for instance, shame or guilt caused by a disability and helplessness due to loss of autonomy/independence. Notes of elderly suicides often concern “being a burden to others”. These suicides are usually non-impulsive. They are thought out in detail and carefully planned. Therefore, lethal outcomes are frequent.

Shame or guilt caused by being a loser – “failed to reach the intended target” – is rather typical for youth suicides and those of young adults. These motives are usually based on massive acute intra- and interpersonal conflicts. An impulsive suicidal decision-making may be provoked by a trivial event – such as, a bad mark at school. The impulsivity of suicidal acts results relatively infrequent in lethal outcome. Therefore, there is a peak for suicide attempts (or parasuicide) in this age group – but not for completed suicides.

Russian scholars refer to a “midlife identity crisis” in order to explain suicide mortality peak in the age group 40-59 years. Gilinskiy & Afanasiev (1993 p115) quote passages from suicidal notes of middle-aged men: “Failed to understand my predestination... The nature does not forgive that.” “In all my days, failed to fulfil the things conceived...”

Some stable personality traits may facilitate the reactions described above.

In mature people, Duberstein (2001) recognized a crucial anti-suicidal role of “openness to experience” (OTE). Individuals with low OTE characteristics prefer to follow a familiar routine. They have a constricted range of intellectual interests and relatively blunted affective and hedonic responses to their environment (Conwell & Duberstein 2001). These conclusions have been drawn after series of case-control studies using psychological autopsy design. Low self-esteem, difficulty of volitional efforts, lacking optimism in stressful situations – these rigid patterns of behaving, thinking and feeling were identified by Ambrumova & Ratinov (1986 p26-44) in persons after suicide attempts, compared to a control group of violent criminals. Anankastic-obsessional and anxious accentuations have been mentioned by Harwood and colleagues (2001) as suicide predictors in a UK case-control study using psychological autopsy interviews with informants.
fore, the results of these studies indicate consistent patterns of cognitive and behavioural rigidity, constricted affect, lack of adaptability and poor coping with changes that life brings.

In younger suicide victims, typical personality traits include impulsivity with dissocial or borderline characteristics. It should be pointed out that the same traits are common in those who commit homicide. Van Praag and colleagues (1990) estimated that at least 30% of violent people have a history of self-destructive behaviour, whereas 20% of suicidal persons have a history of violence.

Probably, these two types of suicidal behaviour – associated with anxious-anankastic traits in elders and with impulsivity in younger people – represent the two extremes of the same phenomenon, i.e. the problem of impulse control.

We assume that impulse control may fail in some individuals in the Alarm stage of stress, resulting in auto- or hetero-aggressive acts. In other cases, loss of impulse control comes along with the increasing Exhaustion, resulting in completed suicide. Perhaps, the same individual may demonstrate these two extremes in different life phases. After acute outbursts with repeated suicide attempts, youthful impulsivity may gradually fade away, and the rigid anxious-anankastic features of personality begin to dominate in the mature age. Suicide attempts in the past are often regarded by psychiatrists as an important risk factor, since they may encourage a later “mature” decision to commit completed suicide. Thus, the same individual may theoretically show a continuum of problems with the impulse control in different life phases.

Probably, the majority of completed suicides are related to the Exhaustion stage, while deliberate self-harm with non-lethal outcomes is more common for the stage of Alarm. Specific personality traits – especially, anxious-anankastic with lacking “openness to experience” – cause a rapid burnout and Exhaustion of vulnerable individuals in stressful situations. On the other hand, these rigid maladaptive traits increase vulnerability to specific situations, which involve changes in important areas.

**3.6.3 Age and gender**

In the most countries, men take their lives more often than women. On the opposite, suicide attempts are more common among females than males. The Russian Federation is not an exception – the male-to-female suicide mortality ratio fluctuates between 4.5 (1990) and 6.6 (2001). In general, men prefer more “effective” ways of suicide like self-hanging – for instance, the proportion of self-hangings in St. Petersburg during 1980s was 66.5% among male and 41.6% among female suicide victims. Women resort to self-poisoning more often than men: 33.7% versus 10.9% (Gilinskiy & Yunatskevich 1999 p59).

Russian authors usually explain the surplus of male suicide victims and higher lethality of male suicide by (1) heavier stress burden in men and (2) better adaptability of women in view of social challenges (Gilinskiy & Yunatskevich 1999 p57).

In the industrialised countries, suicide mortality risk grows with increasing age – typically, people aged 75 and over have the highest mortality rates. In transitional Russia, the age distribution of female mortality due to suicide follows the patterns common for the industrialised countries (Figure 3-4). In Russian men, the highest suicide mortality rates have been observed in the age group 50-59, during the most difficult years of the transition period (Figure 3-3). Generally, the rates of suicide mortality are extremely high in men between 40 and 59 years of age.

Probably, the most plausible explanation of this phenomenon relates to a “midlife identity crisis”. Indeed, for the majority of Russian men in this age group, there is an enormous gap between the ideal and the real level of achievements. It is in the nature of things that mature men with an extensive working experience have definite claims as to their career status, societal acknowledgement, level of material well-being, respect of the others etc. Success in these areas forms the
central part of the “masculine identity”. The old identities underwent some changes after the beginning of the socio-economic transition: for instance, a working aged man non-corresponding to the role of a bread-winner does not match to the new standards of masculinity.

Figure 3-3 Age distribution of male mortality due to suicide, Russian Federation

Figure 3- 4 Age distribution of female mortality due to suicide, Russian Federation

Data source: GOSKOMSTAT / FAIRS (state: 2002)

Massive changes brought about by the socioeconomic reforms almost eliminated the old status achievements for the majority of middle-aged men. Due to the general economic crisis and
growing unemployment, people in this particular age group were placed in the most unfavourable position with respect to their labour market chances and income opportunities. At the same time, some requirements to the masculine “gender standards” increased. This can be illustrated with the following quotation: “What is a man – a husband – worth, who feels unable to feed his family? If he is a real man, he will develop a complex of inferiority” (Lisichkin 1999). Therefore, the “identity crisis” for many men may result in a firm conviction that one’s own being makes no sense, as “the exchange value of Russian men at the domestic market does not exceed the exchange rate of rouble against dollar” (Ryabova & Ryabov 2002 p29-38). These considerations are consistent with the escape theory of Baumeister (1990 p91), according to which “suicide may arise either because standards are unrealistically high or because events are unusually bad, or both”.

Why did the same socioeconomic changes not cause an “identity crisis” of the same magnitude in women? To answer this question, a small excursion in the feminine gender culture of the Soviet time is necessary. A Soviet family was based on “quasi-egalitarian” principles – i.e. women performed the roles of “working mothers”. Professional activities played a significant part in lives of Soviet women; the images of a woman-road-worker and a woman with a jackhammer were propagated in mass-media. However, a career desire was never integrated in the feminine image regulations. Indeed, Soviet women occupied important positions in their working places; these positions were, however, mostly subordinate, less prestigious and not so well-paid. Political activities were considered as a predominantly masculine business.

On the other hand, motherhood and the central role in the family were crucial for the female gender identity. Before the socioeconomic transition, a single childless woman over 30 has been frequently seen by the others as unfeminine and unfortunate, regardless of her labour achievements. The image of a strong, dominant mother – who is, at the same time, an active worker – was transmitted in a course of the Soviet socialisation. Family and private affairs were regarded as a very important job in the organisation of everyday life. Traditionally, women provide social and even medical care for old and sick family members. In the Soviet economy of scarcity, feminine functions were particularly demanding: they required a great deal of “managerial” and communicative skills – e.g., to fix the family up with commodities and food which were in a short supply, to bribe a bureaucrat. And, of course, the feminine identity includes one more very essential function: After retirement, grandmothers are regarded not only as “relatives”, but as “translators of the traditional culture” to their grandchildren (Zdravomyslova & Temkina 1997 p84-89).

In the contemporary Russia, women with children are given every encouragement NOT to work. Frequently, employment advertisements for a wide range of positions exclude women over 35, insist women-applicants wear mini-skirts and bring a picture of themselves in a bathing suit to interviews; applicants should be prepared to “entertain clients”. There are growing numbers of regions, where female unemployment rates exceed those in males. In 1997, there were 19 of such regions, in 1998 – 25 and in 2000 – 33. The average unemployment period in women is longer than in men (ILO 2001 p39).

However, the essential parts of the feminine identity – those involving the key function in the family – underwent comparatively small changes. The role of a housewife has been firmly established in the mind of Russians nearly as a “female profession”, deserving a societal acceptance and a financial support on the part of the family. Therefore, the transitional “identity crisis” in women was not associated with such a massive stress burden as it was in men.

3.6.4 Alcohol consumption

Today, it is widely accepted that both acute and chronic alcohol use are associated with suicidal behaviour (Berglund & Ojehagen 1998). Some authors consider this to be a causal relationship (Brismar & Bergman 1998). Alcohol-related disorders are among the most common mental disor-
orders found in completed and attempted suicides (Pirkola et al 2004). In aggregate-level studies, suicide rates were positively associated with measures of alcohol consumption and heavy drinking in the male populations of the former USSR (Wasserman et al 1994) and Finland (Mäkelä 1996).

A review of articles published between 1991 and 2001 (Cherpitel et al 2004) indicated that the average prevalence of alcohol use in suicide victims was 37 percent, the median was 36 percent, and the range was 10 to 69 percent. In St. Petersburg, the prevalence of alcohol use was 68 and 31 percent in male and female suicide victims, respectively (Gilinskiy & Yunatskevich 1999 p64).

Although researchers are far from understanding all the complex relationships between alcohol use and suicidal behaviour, a number of mechanisms for the association have been proposed.

First, alcohol impairs judgement; it promotes exacerbated negative affects and ideation – e.g., suicide-relevant feelings of hopelessness and related depressive thoughts. At the same time, alcohol produces or intensifies constricted attention (Hufford 2001). This state has been termed as alcohol myopia: "a state of short-sightedness in which superficially understood, immediate aspects of experience have disproportionate influence on behaviour and emotions, a state in which we can see the tree, albeit more dimly, but miss the forest all together" (Steele & Josephs 1990).

The state of cognitive constriction often precedes suicidal behaviour. The immediate – and usually painful – aspects of experience take on disproportionate weight in the delicate balance between choosing life over death among those contemplating suicide. By exacerbating the transient suicidal impulse, alcohol myopia can act as an important risk factor for suicidal behaviour among those with or without alcohol dependence. This cognitive constriction can prevent individuals from identifying effective, non-aggressive coping strategies.

Second, alcohol causes impulsivity, since it removes inhibiting barriers to hurting oneself (Skog 1991) and acts as a trigger facilitating aggressive behaviour, including self-aggression (Plutchik & van Praag 1990 p58-62). The effects of alcohol on cognition and emotions make it more likely that the individual will act on auto-aggressive ideation.

On the other hand, some people may turn to alcohol consumption when feeling aggressive and helpless – due to stressful life events, various losses and conflicts, economic problems etc. In these cases, alcohol represents a self-medication of choice and the cheapest coping strategy, as described above. Pirkola and colleagues (2004) reviewed psychological autopsy studies of alcohol-dependent and depressed individuals and found a strong relationship between stressful life events and alcohol dependence, as well as a greater frequency of interpersonal losses in alcoholics.

Finally, alcohol propels suicidal ideation into action, playing therefore an important role in timing of suicidal behaviour. Individuals with suicidal ideation – both normally abstinent and alcohol dependent – may believe that alcohol can help them to “pluck up courage” for the suicidal act, or to commit suicide painlessly. These expectancies may resolve the ambivalence that often precedes suicidal behaviour. The belief that alcohol intoxication will prevent the physical pain associated with attempting suicide could also be one mechanism that leads people to choose a more violent, and more certain, method of committing suicide (Brent et al 1987).

For these reasons, alcohol consumption should be regarded as an important determinant of suicide. Analogous to its role in homicide, alcohol use may be viewed as a “two-edged” coping strategy in the face of stress arising due to massive abrupt socio-economic changes. We assume that there will be a positive association of “heavy binge drinking” – or its proxy – and suicide rates in the regions of Russia.
3.6.5 Crime and social cohesion / social support

The pioneering work linking social environment and suicide has been performed by Durkheim (1897). The author’s main conclusion was that the moral constitution of the society establishes the contingent of voluntary deaths, regardless of what ethnic populations experienced this phenomenon. Durkheim illustrated that suicide is triggered by the erosion of a society’s capacity for integration. In the situations of rapid large-scale socio-economic changes, social control and norms are weakened. A rapid change deregulates values, beliefs and general norms and fails to rein in or guide individual aspirations. Some scholars imagine the current crises in Eastern Europe and Russia as classical situations leading to anomic suicide (Berkman et al 2000).

The concepts of social support/cohesion, their embedding within a concrete socio-economical context, as well as the possible pathways linking social support/cohesion with stress outcomes have been reviewed above (subsection 3.5.7). The aim of this subsection is to identify proxy-variables, which could represent these concepts in explanatory models of stress-related causes of death in the regions of Russia.

Our efforts to find appropriate proxy-measures faced considerable difficulties, since the terms of social cohesion and social support are often used loosely and interchangeably.

In ecological studies with suicide rates as a dependent variable, a common practice is to use divorce rates (Gunnell et al 2003; Kondrichin & Lester 2002; Aihara & Iki 2002), which are, as a rule, positively associated with the outcome of interest. According to the theory of attachment (Bowlby 1969), using of divorce as an indicator of poor social support can be legitimated by the role of secure marriage, providing a “protective shell in times of need” (Holmes 1993 p81). However, there is an opposite view of Granovetter (1973), relativizing the role of this “protective shell” in its relation to life-opportunities: “Weak ties” facilitate the diffusion of information and provide opportunities for labour mobility and, therefore, a better access to material goods, resources and services. The latter may be especially true for the post-Soviet Russia, where regions with a better access to material resources – measured, for instance, by inflation-adjusted savings per capita – demonstrate low suicide rates and high divorce rates (Belgorod region, Volgograd region, Lipetsk region, Moscow, St. Petersburg etc).

Higher levels of labour mobility and stronger bonds of social support/cohesion are typical for some ethnic groups – e.g. in the cultures of the North Caucasus (ILO 2001 p118), as discussed above (subsection 3.5.7). Therefore, “ethnic composition of the regional populations” may be regarded as an appropriate proxy-measure for social support/cohesion in Russian regions.

Crime can be seen as an expression of social disruption, distrust and hostility. Therefore, crime is closely related to the concepts of social cohesion/social support. Kawachi and colleagues (1999) regarded crime as an indicator of societal health. Sociological theory (Merton 1968) has attributed high crime rates to a sense of anomie, engendered by the cultural high value placed upon competitive achievements. According to Durkheim, anomie is one of the most important social causes of suicide.

A series of individual- and aggregate-level studies have found that crime is closely associated with suicide. A multiple regression analysis of Boor & Bair (1990) revealed significantly lower suicide rates in the U.S. states with low divorce rates, low crime rates and stringent firearm control laws. High suicide mortality has been found in populations generally characterised by antisocial behaviour. In male criminal offenders followed-up by Kullgren and colleagues (1998), the standardised mortality ratio (SMR) for suicide was approximately 12 times higher than in the general population. In this study, no specific principal diagnosis showed significantly increased risks for completed suicide. However, there was no appropriate control group.
Studies of youth suicide and suicide attempts suggest that risks of suicidal behaviour tend to be increased in young people exposed to parental antisocial behaviour, physical and sexual abuse (Beautrais 2000). In a national sample of U.S. adults, Simon et al (2002) have found that victims of violence – rape etc – were approximately six times more likely to report experiencing suicidal ideation or behaviour than non-victims.

We assume that very specific population segments will be involved in criminal or suicidal behaviour under the circumstances of growing socio-economic stress, societal disruption and hostility – first of all those who will experience major life problems that seem not to be solved through conventional channels. An approval of suicide or crime by a person may be based upon cultural cues in a particular population group. It may be mediated by personality-related attributes, stress stage, general attitudes in a referent group, availability and quality of social support etc.

The share of these vulnerable population segments may vary in time: it may drastically increase during the profound socio-economic crises associated with growing inequalities and massive impoverishment of the population. Therefore, it is to expect that there will be a positive association of crime and suicide rates in a panel data analysis of Russian regions.

3.6.6 Unemployment

The impact of unemployment on health and mortality has been intensively studied from the late 60s/early 70s onwards – both with individual- and aggregate-level approaches. Specifically for suicide, a total of 251 articles were identified through the National Library of Medicine, via MEDLINE/PubMed-retrieval,\(^8\) providing access to more than 11 million bibliographic citations and abstracts in the fields of medicine, public health, life sciences etc.

There is considerable empirical evidence – non-confounded by socioeconomic factors – that being unemployed is associated with an increased risk of suicide death compared with being employed. The studies cited below constitute a good example, as they consider socioeconomic confounder.

Findings from the Office of Population Censuses and Survey Longitudinal Study in the UK (Moser et al 1987) demonstrate a strong association of unemployment with suicide in times of both high (1981 census) and low unemployment (1971 census). In a Danish population, there was elevated attributable risk of suicide deaths associated with unemployment – even after adjustment for mental illness and marital status (Mortensen et al 2000). In a recent New Zealand cohort study with three years of follow-up of 2.04 million respondents, there were twofold to threefold increased relative risks of death by suicide among unemployed, adjusted for marital status confounder. Using sensitivity analyses – a multilevel approach – the authors came to a conclusion that about half of this association might be attributable to confounding by mental illness (Blakely et al 2003).

Generally, individual-level studies – controlled for confounding by social factors – find an approximately twofold excess suicide risk among the unemployed. However, the possibility of health selection remains; the same is true for a residual confounding by prior health status differences, childhood circumstances and recent stressful life events.

Among the aggregate-level studies, time series analyses are of greater interest. Thus, annual levels and changes of stress-related cause-specific mortality rates – particularly for suicides – have been examined in relation to annual levels and fluctuations of unemployment/employment rates and other economic (e.g., gross domestic product per capita), social and behavioural risk factors (alcohol, tobacco, fat consumption). In particular, M.H. Brenner (e.g., 1980, 1983, 1987,
CONCEPTUAL MODELS – (A) STRESS

1993 p369-391 and 2002) succeeded to demonstrate that post-World War II fluctuations in unemployment and business failure rates, decline in real per capita income are strongly associated with suicide mortality. Economic growth has been found to play a principal role in reducing mortality at nearly all ages. By contrast, economic recession was related to increases in mortality due to psychopathological conditions for virtually all age groups, in both sexes. In Brenner’s studies, unemployment seemed to be a principal detrimental factor to health. These findings have been consistently replicated for different industrialised countries – e.g., UK, Sweden, USA and 15 countries of the European Union. Adjustments were made for various short- and long-term trends, and time lags of varying length were explored.

If we assume a causal character of relationships between unemployment and suicide, there may be the following possible pathways:

- acute and chronic stress generated by loss of income and material resources in unemployed;
- downward mobility in socioeconomic status;
- accumulation of recent stressful life events – e.g., financial and family problems;
- increase of behavioural risk factors – e.g., alcohol consumption;
- development of a psychiatric illness – e.g., alcohol dependency – which is, in turn, an important risk factor for suicide etc.

Therefore, unemployment rates or their approximation should be considered in studying suicide mortality with Russian regional panel data. However, there may be substantial difficulties related to some peculiarities of Russian unemployment, as discussed in the analytical paper of the International Labour Organisation (ILO 2001 p35-39).

First, unemployment in Russia is locally bound, i.e. there may be an intraregional heterogeneity of the labour market. Partly, this may be attributed to a mono-industrial profile of many cities, towns and districts. Another important contributing factor is a relatively low territorial mobility of the population, limited by high transportation/housing expenses and great distances. For these reasons, we may not be able to capture the effect of these striking differences in unemployment rates at interregional level. Therefore, the effects of unemployment may be largely concealed due to an aggregation bias.

Second, according to the estimations of the ILO experts, hidden unemployment in Russia is of much greater scale than the explicit one. There may be the following forms of hidden unemployment:

- those being forced to administrative leaves or part-time employment;
- those working but not receiving wages;
- those underemployed due to temporal or relatively permanent absence of a job – if the manufacture was halted, but administrative leave had not been imposed and working-hours had not been cut down;
- those employed at the jobs which do not require the qualifications and experience the workers possess, while the latter are eager to get the employment up to their qualifications;
- those out of job, but searching for it and ready to start working; they had casual earnings within the control week;
- those out of job, but eager to work and ready to start working; they ceased active job-search – so-called “disillusioned unemployed”.

Probably, this quotation requires some comments and explanations. During the massive economic crisis, by which manufacturing industry branches – and especially defence industry – have been particularly affected, the majority of enterprises did not resort to strong tough measures like
lock-outs. It was in the interest of directors to preserve a team: first, because of plans to expand manufacture and second, because the chances to lobby the interests of the particular enterprise are determined by its size. Finally, the system of social support to the unemployed is in a critical condition; the employers are impotent and reluctant to fulfil their commitments to the laid off workers. The employers are also encouraged by a passive reaction of courts in case the labour legislation is violated, along with flaws in existing labour legislation itself.

For these reasons, a huge army of workers on hidden unemployment came into being during the socio-economic transition. On the other hand, in 1996-1997, the excessive employment was estimated in average at the level of 25-45 percent of the total number of employed (ILO 2001 p37).

When manufacture was halted, the measures like administrative – non-paid – leaves or cutting down of working-hours were widely used by the administration of enterprises. In cases of long-lasting payment delays, workers did not receive any wages or received “compensations” in-kind.

Many people got discharges at their own request, but did not officially register their unemployment status because of several reasons. Parly, it happened due to extremely small unemployment benefits and delays in their payment. In July 1999, the ratio between the amount of the average wages and paid benefits per unemployed person decreased to 25.5 percent throughout the Russian Federation (ILO 2001 p42-43).

Another reason may be attributed to mistrust of people to the public institutions. Being disillusioned that they may find an appropriate job through employment agencies, people preferred to rely on themselves. In addition, there were purely bureaucratic problems. Thus, officially unemployed persons should be registered by a Job Centre twice within a month, even if this time-consuming affair – long waiting lines etc – does not result in getting employed. Finally, many people in rural areas do not register as unemployed because of the difficulties of travelling to Job Centres.

Therefore, the official unemployment or employment figures are far from reflecting the real labour market situation. The basic tools of Western labour market theory may have considerable limitations, when applied in Russia. If we want to ferret out major effects of unemployment in Russian regions, we have to experiment with the following labour market indicators:

1. We can try to use unemployment rates according to the methodology of the International Labour Organisation. Unlike the index of registered unemployment, which is based on numbers registered by the State Employment Services, the general ILO-unemployment figures are obtained through labour force surveys carried out with the ILO methodology (GOSKOMSTAT 2002).

Exactly, unemployed persons in Russia comprise those aged 15-72 years who were:

(a) without work during the reference week – in paid employment or self-employment;
(b) actively seeking work, i.e. had taken specific steps – having been in contact with a public or commercial employment office to find a work; placing or answering job advertisements; applying to employers directly; asking among friends, relatives, unions etc to find work; looking for land, premises or equipment etc in order to get self-employed etc;
(c) currently available for work.

The unemployment rates (UR) are calculated by dividing the number of unemployed (UN) by the economically active population (AN):

\[
UR = \frac{UN}{AN} \times 100\%
\]
However, there is an opinion (ILO 2001 p41) that the unemployment parameters, disclosed by labour force surveys, do not exactly mirror the actual situation.

2. A proxy for “chances to get employed” can be used.

GOSKOMSTAT (2002) provides the index “number of registered unemployed per one officially registered vacant position”. The officially – i.e. through the State Employment Services – registered figures reflect only the tip of the unemployment iceberg. However, this index serves as a practical tool to estimate labour market conditions, to reveal regions in crisis and to develop unemployment policy (ILO 2001 p39).

The state programs to encourage employment are based on the very index of the registered unemployment. For this reason, the “number of registered unemployed per one registered vacant position” may actually mean the effectiveness of regional State Employment Services in adjustment the unemployed population to labour market conditions. Therefore, this index may be regarded as a proxy for “chances to get employed”, provided by the State Employment Services.

3. Finally, we may try to use a proxy-variable for “hidden unemployment”.

Since manufacturing enterprises were largely affected by the economic crisis and hidden unemployment, we assume that inflation-adjusted figures on industrial production volume may represent a reasonable proxy for the hidden unemployment.

3.7 Conceptual summary

We suggested a conceptual multilevel model of stress for investigating the influence of transition-related stress factors and heavy binge drinking on selected causes of death – homicide and suicide – in the Russian Federation. The objective of this approach is to generate a general frame of reference for the econometric modelling of stress-related mortality in the regions of Russia between 1990 and 2001.

Within this period of time, the socioeconomic transition was associated with enormous changes in the population living standard. Three groups of factors are assumed to have played a role of the core transition-related stressors for the regional populations (Table 3-1). They resulted in a sharp increase in income inequality, with a considerable proportion of the population living below a subsistence minimum level. Since the subsistence minimum amount is generally based on the cost estimation of the consumer basket, it is broadly used as a poverty margin. In a former egalitarian society, rising poverty and income inequality are hypothesised to cause a growing incongruity between material expectations and reality. This incongruity induces an adjustment reaction – i.e. stress in the broad sense.

In accordance with the concept of Selye, stress is an unspecific reaction to any threat / stressor. The author viewed stress as a three-stage sequence of neuro-endocrine reactions – involving activation of sympathetic-adrenal and pituitary-adrenal systems which leads to elevated secretion of ACTH, glucocorticoids etc.

The Alarm Reaction is equivalent to fight-or-flight response; it is an immediate reaction to acute stress. Alarm mobilises bodily energetic resources and maximises the expenditure of energy (“attack mode”). The Stage of Resistance is a continued state of arousal, if the stressful situation is prolonged. The Exhaustion stage occurs after the long-lasting resistance. During this stage, the body’s energy reserves are finally exhausted and breakdown occurs.
Table 3-1 Core transition-related stressors

<table>
<thead>
<tr>
<th>Groups of transition-related stressors</th>
<th>Meaning and mechanisms</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Financial losses of the population</td>
<td>dynamically developing material deprivation</td>
</tr>
<tr>
<td>(2) “Side-effects” of incomplete economic restructuring in unstable and insecure economic environment</td>
<td>→ break-up of the “old pathways” – economic restructuring, development of consumer-oriented branches (trade and services);</td>
</tr>
<tr>
<td></td>
<td>→ risks related to economic activities of the population (high-risk-jobs, multiple working places, odd jobs, including those in the “shadow economy”);</td>
</tr>
<tr>
<td></td>
<td>→ risks of economic losses for beginner-businessmen – bureaucratic difficulties and corruption, heavy tax burden, unpredictable inflation development, insufficient legal security regulation etc</td>
</tr>
<tr>
<td>(3) Elevated magnitude of transition-related problems in climatically disadvantaged areas</td>
<td>→ arduous living conditions, excessive physical hardship</td>
</tr>
<tr>
<td></td>
<td>→ higher costs of living and production, accelerated by inflation</td>
</tr>
</tbody>
</table>

Each stage includes various psychological symptoms (Table 3-2, A) which appear in a case of distress – i.e. negative intensive stress disturbing the organism's homeostasis. In combination, these symptoms determine behavioural patterns, crucial for the manifestation of outcomes of interest – homicide and suicide. In line with Selye’s concept, homicide and suicide are assumed to manifest at different stress stages.

Whether a person will develop a specific form of a stress-related outcome, or not, will depend on stress intensity and duration, as well as on individual vulnerability and coping capacity. The duration of stress determines the stress stage, although this aspect varies greatly across individuals. Some people may rapidly develop a profound Exhaustion as a reaction to a definite protracted stressor – i.e. within a few months or even weeks, whereas others will need years of continuing stress exposure to develop the same condition.

Crucial is the evidence that a non-impulsive suicide behaviour resulting in completed suicide is more prevalent in population groups exposed to a profound Exhaustion. Homicide (unpremeditated!) is assumed to be committed in an “attack mode” which is typical for the Alarm stage of stress.

Homicide and suicide are considered to be consequences of a counterproductive stress response (maladaptive coping). These two outcomes are, of course, not the sole forms of stress response. They represent, rather “the tip of the iceberg”. However, this tip is well defined and represented by valid statistical data, since the vast majority of these diagnoses are confirmed in medical-legal autopsies. Chronic somatic conditions with substantial public health relevance – e.g., circulatory system diseases – may be assumed to develop largely in an intermediary stage of stress. The high level of stress hormones during the Resistance phase may upset homeostasis and harm internal organs leaving the organism vulnerable to disease. This category of death causes is not analysed in this paper – first of all, due to potential problems with data quality. Circulatory system diseases are not regarded as “unnatural” causes of death; therefore, autopsies are not made in all cases. Unfortunately, a valid diagnosis of a circulatory system disease can be made only on autopsy: there is evidence that e.g., myocardial infarction is correctly recognised only in half of all cases (Höpker & Wagner 1998). Regional data on circulatory system mortality may be biased, as non-forensic autopsy rates vary across regions in Russia. For these reasons, “chronic somatic conditions” are only outlined in Table 3-2, without further specifications of their features.
Since we hypothesised that different stress stages are characterised by specific behavioural patterns – i.e. an excessive risk in Alarm and escape/passivity in Exhaustion – it can be expected that the sets of regressors will differ for the “best fitting” econometric models of suicide and homicide mortality. Thus, the “best fitting” model of homicide mortality would probably include explanatory variables which indicate the presence of risks associated with the economic restructuring and development of (complementary) economic activities of the population. Correspondingly, suicide mortality is likely to be better explained by variables indicating economic “passivity” of the regional populations.

We assume that low purchasing capacity of inhabitants will substantially hamper the development of trade and services in economically depressed industrial and agricultural regions. Consequently, the population of such regions will lack for opportunities of “shadow” or legal employment in these branches. In other words, the population of “depressed” regions will be economically less “active”. Therefore, the set of explanatory variables in econometric models for suicide should include agricultural and manufacturing production in order to characterise the background of economic “passivity” of the regional populations.

The “classical determinants” of homicide and suicide mortality have been widely reviewed in the epidemiological literature (Table 3-2, B). Many studies used them as predictors of aggressive and auto-aggressive outcomes. In the framework of the psychosocial model of stress suggested in this chapter, these determinants are hypothesised to be closely linked to stress vulnerability and coping resources of individuals and populations. Therefore, they can be considered to act as stress moderators.

The first group of moderators can not be measured at the aggregate level. It includes specific personality traits or mental health problems. However, it constitutes an integral part of the psychosocial model, since these individual-level determinants explain an increased vulnerability to particular stress stages and a predisposition either to exaggerated Alarm reactions or to a rapid development of Exhaustion. Therefore, they are important for understanding the manifestation pathways of the extreme forms of aggressive and auto-aggressive behaviour.

The second group of moderators – those related to age and gender – should be taken into account when the research objective is to explain the drastic increase of the premature male mortality in Russia. We hypothesise that a stress burden may to a considerable extent be mediated by societal norms and values – first of all by those concerning gender “standards”, masculine and feminine roles and identities. Working age men were in a particularly demanding psychological situation during the last decades, since new gender “standards” made them largely responsible for the material well-being of their families. Therefore, the effects of these moderators can be approximated by the age-specific mortality.

The third group of “classical determinants” is often used in aggregate-level studies concerning homicide and suicide as outcomes. It includes alcohol consumption/ heavy binge drinking, crime, education, social cohesion/social support and unemployment.

The novelty of our approach includes three basic components:

- First, wherever possible, we have identified indicators/proxies of the presence of the “classical determinants”, suitable for a cross-sectional time-series analysis of Russian regional panel data.
- Second, the core transition-related stressors have been considered which are specific for the time and place analysed.
- Finally, outcomes of interest have been located within the stages of stress.

The basic features of the psychosocial model of stress are illustrated by Scheme 3-4.
## Table 3-2: Psychosocial model of stress

### A. FEATURES

<table>
<thead>
<tr>
<th>STAGES OF STRESS</th>
<th>Aggregate-level measures (or proxies) for Russia</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alarm</strong></td>
<td>acute stress, &quot;attack mode&quot;</td>
</tr>
<tr>
<td><strong>Resistance</strong></td>
<td>prolonged stress</td>
</tr>
<tr>
<td><strong>Exhaustion</strong></td>
<td>prolonged stress, exhaustion of energetic resources</td>
</tr>
</tbody>
</table>

#### Stress duration
- **Acute stress**, "attack mode"
- **Prolonged stress**, exhaustion of energetic resources

#### Symptoms
- Fear of potential harm or loss, perception of environment as threatening one, diminished pain perception, distorted thinking
- Profound fatigue / lack of energy, anhedonia / lack of motivation, feeling of losses (psychological reaction to an irremediable event)

#### Behavioural patterns
- Excessive risks
- Escape

#### Outcomes
- Unpremeditated homicide
- Chronic somatic conditions (e.g., circulatory system diseases)
- Non-impulsive suicide

#### Aggregate-level measures
- Cause-specific mortality rates, SDR

### B. "CLASSICAL DETERMINANTS" OF MORTALITY (STRESS MODERATORS)

<table>
<thead>
<tr>
<th><strong>Personality</strong></th>
<th>elevated anxiety, impulsivity, fixation on fears, aggressive tendencies, mistrustfulness, suspiciousness</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>increased individual vulnerability</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Physical / mental health problems</strong></th>
<th>brain damage due to a trauma/disease (anamnestically), signs of organic psycho syndrome</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>increased individual vulnerability</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Age and gender</strong> (Russia)</th>
<th>Criminals: mostly men (90%), age 20-40 years; Victims: mostly men, age 20-59 years; male-to-female ratio: 3:4; women: two age peaks: 30-59 and 80+</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>highest mortality in men of 50-59 years (during the most difficult years of transition); women: growing mortality with increasing age</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Alcohol consumption</strong> (heavy binge drinking)</th>
<th>trigger of aggressive behaviour</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>Crime</strong></th>
<th>trigger of auto-aggressive behaviour; &quot;alcohol myopia&quot; promotes cognitive constriction and prevents effective non-aggressive strategies</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>Education</strong></th>
<th>low education → low coping resources</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>low education → low coping resources</td>
</tr>
<tr>
<td></td>
<td>rate of graduate specialists with a university (or equivalent) degree</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Social cohesion / social support</strong></th>
<th>low social cohesion/support → low coping resources</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>Unemployment</strong></th>
<th>loss of material resources; downward mobility in socioeconomic status; increase in behavioural risk factors etc</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>low coping resources</td>
</tr>
</tbody>
</table>

|                  | loss of material resources; downward mobility in socioeconomic status; increase in behavioural risk factors etc |
|                  | low coping resources |

### Additional remarks
- Alcohol poisonings mortality
- Crime rates
- Rate of graduate specialists with a university (or equivalent) degree
- Ethnic composition of regional populations
- Unemployment rates (ILO methodology) - "chances to get employed": number of registered unemployed per one vacant position
- "Hidden unemployment": volume of industrial production (inflation adjusted)
CONCEPTUAL MODELS – (A) STRESS

Scheme 3-4 Psychosocial model of transition-related stress, basic features

Coping resources, e.g.:
- Increased economic activity ("survival strategies")
- Social cohesion / support
- Resources for educational skills improvement
- Employment chances
- Lifestyle-related resources
CHAPTER 4 – CONCEPTUAL MODELS: (B) FATAL ALCOHOL POISONINGS
4.1 Introduction

Excessive use of alcohol is generally believed to be a major cause of morbidity and mortality in modern societies. The epidemiological literature concerning the former Soviet Union countries was committed to the idea that alcohol-related human losses were largely responsible for the mortality crisis of 1990s.

Despite the common statement that enormously high alcohol consumption is one of the major causal factors of Russian “mortality epidemics”, this issue appears to be poorly investigated. The basic obstacles refer to problems in assessment of alcohol consumption and related harm. These complex issues deserve a special attention in this chapter. We investigate the following questions:

- How can we assess alcohol-related harm? What alternatives do exist?
- How reliable are “hard data” on alcohol-related mortality?
- How reliable are “soft data” on alcohol consumption and drinking habits?

There is a wide-spread practice of employing alcohol poisoning deaths as a proxy for heavy binge drinking. Since the same strategy is used in our paper, data validity and reliability are discussed for alcohol poisoning deaths in detail. We review both the forensic aspects and the effects of diagnostic and coding practices.

In order to understand the “ecological role” of fatal alcohol poisonings, we explore their individual- and aggregate-level determinants. These efforts result in the elaboration of the conceptual model of heavy binge drinking mortality in the regions of the Russian Federation.

4.2 Alcohol-related mortality

Alcohol-related mortality has been widely used in order to evaluate the impact of alcohol consumption on life expectancy / years of life lost (CDC 1990; Shultz et al 1991; Sjogren et al 2000; Cipriani et al 2001).

The most common alcohol-related deaths include: fatal traffic accidents due to drunken driving, alcoholic psychoses, chronic alcoholism/dependence syndrome, degeneration of nervous system due to alcohol – cerebral degeneration, encephalopathy etc – alcoholic polyneuropathy, alcoholic cardiomyopathy, esophageal varices, liver cirrhosis, pancreatitis, certain cancers etc. The WHO Regional Office for Europe (Rehn et al 2001 p21-34) reviews alcohol-related harm using mortality data on chronic liver disease and cirrhosis, external causes of injury and poisoning, and motor vehicle traffic accidents.

The term “alcohol-related” is a conditional label. At a certain level of consumption, the risk of a consequence increases, but it does not necessarily indicate causality.

Among the deaths directly – causally – related to excessive alcohol consumption, at least two groups of causes can be mentioned.

1. The first group deals with the effects of chronic heavy drinking. When the exact cause of death is assessed by pathologists, findings of specific organ damages are usually documented. These organ damages depend on the mechanism of death. They may include fatty liver, fibrosis or cirrhosis of liver, signs of gastrointestinal bleeding if portal hypertension and varices were present, changes of myocardium etc. However, in “chronic” cases, elevated levels of blood ethyl alcohol concentration (BAC) may not be found.
To exemplify, chronic heavy drinking leads to metabolic disturbances such as hypoglycemia, hyperlipidemia, and hyperlactemia. Lack of a proper diet in alcoholics combined with the empty calories derived from combustion of ethanol exaggerates the potential for hypoglycemia. Under these conditions, the main energy source switches from glucose to catabolism of fats. Fats catabolism produces excess ketone bodies in the blood – i.e. acetone, acetoacetate, and acetoxybutyrate – and in many instances a dangerous state of metabolic ketoacidosis. Metabolic ketoacidosis is often suggested as a likely cause of death in alcoholics found at home with low or zero blood-ethanol concentration and nothing more remarkable at autopsy than a fatty liver (Jones & Holmgren 2003).

2. The second group concerns deaths in a state of alcoholic intoxication. Therefore, in a forensic expertise of such cases, increased levels of BAC are usually detected. A very common alcohol-related death from this group is aspiration of vomit, blocking the airways and resulting in asphyxia by impairing the gag reflex.

Positional asphyxia is another likely scenario, if a drunken person is placed in an awkward position to “sleep it off”. This might lead to compromised breathing and potential serious consequences.

The next of the many fatal effects of heavy drinking is lowering of the core body temperature. This may become exaggerated, if a drunken person falls asleep in a cold environment in winter.

Burns are another possibility and typically occur when a drunken person falls asleep in bed while smoking a cigarette, which may be dropped into the bedding, death ensuing from burns or carbon monoxide inhalation.

Drowning is another common sequel, particularly in seamen and others who live and work around ships or docks, as they fall from quays, gangways and decks when unsteady due to drink (Shepherd 2003 p161).

And, last but not least, alcohol intoxication itself may cause death. In accidental poisonings by alcohol, highest possible BAC levels are typically found.

Accidental poisoning by alcohol is included in the International Classification of Diseases – in the chapter dealing with external causes of morbidity and mortality (ICD-10: Chapter XX, code X45; ICD-9: Supplementary Chapter XXI, code E860).

Within the ICD-10, it is listed under the rubric “accidental poisoning by and exposure to noxious substances”, referring, namely, to the following types of alcohol:

- butyl (1-butanol),
- ethanol,
- isopropyl (2-propanol),
- methyl (methanol),
- propyl (1-propanol),
- fusel oil and, finally,
- alcohol not otherwise specified.

The definition stresses its accidental – unintentional – character, excluding any homicidal or suicidal intent, as well as intent to harm. Evidence of alcohol involvement in, for instance, traffic fatalities due to drunken driving should not be coded as accidental poisoning by alcohol.

In order to identify the exact cause of deaths in each case suspicious for accidental poisoning by alcohol, a forensic autopsy should be carried out, since the mechanisms by which alcohol kills depend on circumstances of death, and any trauma associated with gross alcohol intoxication needs to be excluded. Such autopsies are required in all obvious or suspected unnatural deaths –
including suicides, homicides, accidents, whether transportational, occupational or domestic – in accordance with the Recommendation No R (99) 3 on the Harmonisation of Medico-Legal Autopsy Rules, adopted by the Committee of Ministers of the Council of Europe (Brinkmann 1999).

4.2.1 Accidental poisoning by alcohol – forensic issues

Measurements of blood alcohol concentration (BAC) represent a typical diagnostic tactic in forensic expertise of alcohol poisonings cases, since it is the only applicable objective variable to quantify the level of intoxication and to differentiate between acute alcohol poisoning and other possible causes of death, including other alcohol-caused deaths (Lahti & Vuori 2002).

However, with respect to ethanol, opinions differ about the blood concentration necessary to cause death. Different authorities cite different fatal blood ethanol concentrations, such as:

- 0.35 to 0.40 g/100 mL (Schulz & Schmolot 1997),
- 0.40 g/100 mL (Repetto & Repetto 1999),
- range 0.225 to 0.40 g/100 mL (Stead & Moffat 1983) etc.

One of the problems of determining fatal concentrations relates to tolerance development. To illustrate this, in Australia, numerous drunken drivers have been found to have BAC levels of over 0.50 g/100 mL, when they should technically be dead. Some people survived alcohol concentrations of over 1.50 g/100 mL, albeit with medical support in intensive care. These individuals are almost always chronic alcoholics (Shepherd 2003 p161).

The figures on BACs published in the research literature reflect, probably, the experiences of pathologists and toxicology laboratories handling hundreds or even thousands of cases analysed. It has been shown that the post-mortem distribution of toxic substances is far from uniform. High variability in the estimations of blood alcohol concentrations may result from drawing blood specimen from different sampling sites, e.g., heart or peripheral vein. The best place to obtain blood at autopsy is from peripheral blood vessels, for instance, from the femoral or iliac veins, or, if no blood is available from these sites, from the axillary veins (Shepherd 2003 p157).

The blood ethanol concentration determined at autopsy is not always a reliable indicator of the concentration prevailing at the time of death (Jones & Holmgren 2003).

1. In some cases, it may exceed the concentration at the time of death due to a post-mortem diffusion of ethanol if it remains unabsorbed in the stomach at the moment of death. This may be particularly a problem, if blood specimen has been taken from places located closer to the gastric wall – e.g., heart or great vessels in the chest.

2. Some people survive for several hours after a bout of heavy drinking and after they become stuporous or comatose, during which time blood-alcohol concentration decreases through metabolism.

3. The concentration of ethanol decreases slightly after death owing to on-going enzyme activity as the body cools.

4. A post-mortem synthesis of ethanol – probably as a result of microbial action on blood glucose – has been reported (Jones & Holmgren 2001).

Therefore, accidental poisoning by alcohol is not always a trivial diagnosis.

4.2.2 Accidental poisoning by alcohol – comparability of statistical data

Compared with other major epidemiological problems, the issue of alcohol poisonings appears to be poorly investigated. Only a total of 227 articles were identified through the National Library of
CONCEPTUAL MODELS – (B) ALCOHOL

Medicine, via MEDLINE/PubMed-retrieval using a very broad search strategy – i.e. without any restrictions of article/abstract language, year and type of publication, population studied etc.\(^9\)

This is an extremely small figure in comparison with vast thousands of articles dealing with e.g., completed suicide. The narrowed search strategy – limited with respect to publication type (NOT case reports) and population studied (adults) – produced a total of 65 articles.\(^{10}\) The most recent research materials published from 1990 onwards number 31 articles. Surprisingly, more than a half of them relates to the situation in the Eastern European countries (16 publications) and, particularly, in Russia or other countries of the former USSR (11 publications).

In the majority of Western industrialised countries, accidental poisoning by alcohol seems to be NOT the foremost important public health problem. For instance, in the 25 countries of the European Union, the average SDR level fluctuates from 0.59 to 0.71 per 100 000, whereas in Belarus the highest mortality rate observed was 26.27, in Estonia – 29.72 and in Russia – 37.7 per 100 000 population (Table 4-1). Among the industrialised countries belonging to the WHO-European Region, only Finland shows relatively high alcohol poisonings mortality which ranges from 5.02 to 7.03 per 100 000 within the time span presented in the table.

While these comparisons of mortality due to accidental poisoning by alcohol point out large differences between the countries, they can only suggest hypotheses for risk factors that may be important – e.g., national drinking patterns and resulting differences in alcohol consumption.

First of all, however, the problem of data reliability and validity should be considered. Are the variations between the countries real or artefactual due to differences in (1) autopsy rates and (2) coding practice?

(1) Today, pathological autopsies are recognised as a measure of quality assurance in clinical medicine. Forensic autopsies are essential for the discovery of non-natural or violent deaths. Nevertheless, there are still enormous differences in forensic and pathological autopsy practices – despite the introduction of the Recommendation No R (99) 3 on the Harmonisation of Medico-Legal Autopsy Rules, adopted by the Committee of Ministers of the Council of Europe.

In Italy, for instance, a forensic autopsy is only performed in cases of a suspected crime. In Southern European countries like Greece, Italy, Portugal and Spain, many cases of unnatural death – especially outside the metropolitan areas – are examined by a family doctor who often writes a diagnosis that would be more socially acceptable, in order to avoid social or economic damage to the relatives of deceased. In the presence of a known disease as hepatitis or cardiac illness a forensic autopsy is not performed even in persons who have died from alcohol intoxication (Spiliopoulos 2001 p14-15).

Rockett & Smith (1999 p122-129) cited the mean total autopsy rate of 21 percent among 25 countries reporting this information to WHO. In 1996 (WHO 1998), no information about total autopsy rates was available for the following countries of the WHO European Region: Albania, Belgium, France, Greece, Israel, Italy, Luxembourg – except for perinatal deaths – Portugal and Spain. Here, only the countries are listed which report these data to the WHO. Data from Finland are regarded as the best available with respect to autopsy rates and diagnostic accuracy (Lahti & Vuori 2002; Brinkmann et al 2002).

---

\(^9\) The following limits were set for the MEDLINE/PubMed search: (alcohol poisoning OR alcohol poisonings), words included in the title and abstract of a citation, requested 28. October 2004.

\(^{10}\) requested for: (alcohol poisoning[tiab] OR alcohol poisonings[tiab]) AND ("adult"[MeSH Terms] OR adult[Text Word]) NOT case reports[pt], 28. October 2004
### Table 4-1 Accidental poisoning by alcohol in the countries of the European Union and former Soviet block (WHO European Region) SDR per 100,000, both sexes

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Armenia</td>
<td>0.05</td>
<td>0.13</td>
<td>0.18</td>
<td>0.12</td>
<td>0</td>
<td>0.05</td>
<td>0.07</td>
<td>0.03</td>
</tr>
<tr>
<td>Austria</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.03</td>
<td>0</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>Azerbaijan</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.21</td>
<td>0.15</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>Belarus</td>
<td>21.35</td>
<td>21.46</td>
<td>23.12</td>
<td>23.15</td>
<td>26.27</td>
<td>24</td>
<td>22.93</td>
<td>24.46</td>
</tr>
<tr>
<td>Belgium</td>
<td>0.1</td>
<td>0.06</td>
<td>0.06</td>
<td>0.07</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bulgaria</td>
<td></td>
<td>0.99</td>
<td>0.79</td>
<td>0.72</td>
<td>0.74</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Croatia</td>
<td>0.25</td>
<td>0.34</td>
<td>0.22</td>
<td>0.22</td>
<td>0.2</td>
<td>0.12</td>
<td>0.14</td>
<td></td>
</tr>
<tr>
<td>Cyprus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Czech Republic</td>
<td>0.72</td>
<td>1.05</td>
<td>1.09</td>
<td>1.31</td>
<td>1.33</td>
<td>0.92</td>
<td>1.23</td>
<td>1.11</td>
</tr>
<tr>
<td>Denmark</td>
<td>0.48</td>
<td>0.59</td>
<td>0.45</td>
<td>0.35</td>
<td>0.26</td>
<td>0.51</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Estonia</td>
<td>29.72</td>
<td>24.26</td>
<td>18.82</td>
<td>16.23</td>
<td>18.34</td>
<td>17.2</td>
<td>20.2</td>
<td>25.05</td>
</tr>
<tr>
<td>Finland</td>
<td>6.4</td>
<td></td>
<td></td>
<td>5.05</td>
<td>7.02</td>
<td>6.88</td>
<td>7.03</td>
<td>7.2</td>
</tr>
<tr>
<td>France</td>
<td></td>
<td>0.01</td>
<td>0.01</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Georgia</td>
<td>0.3</td>
<td>0.62</td>
<td>0.41</td>
<td>0.52</td>
<td>0.29</td>
<td>0.22</td>
<td>0.2</td>
<td>0.13</td>
</tr>
<tr>
<td>Germany</td>
<td></td>
<td>0.11</td>
<td>0.05</td>
<td>0.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Greece</td>
<td></td>
<td>0.01</td>
<td>0.02</td>
<td>0.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hungary</td>
<td></td>
<td>0.56</td>
<td>0.52</td>
<td>0.22</td>
<td>0.3</td>
<td>0.19</td>
<td>0.23</td>
<td></td>
</tr>
<tr>
<td>Ireland</td>
<td>0.37</td>
<td>0.13</td>
<td>0.07</td>
<td>0.06</td>
<td>0.12</td>
<td>0.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td></td>
<td>0</td>
<td>0.01</td>
<td>0.01</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kazakhstan</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kyrgyzstan</td>
<td>17.09</td>
<td>17.36</td>
<td>10.52</td>
<td>9.96</td>
<td>10.96</td>
<td>9.71</td>
<td>11.06</td>
<td>11.18</td>
</tr>
<tr>
<td>Latvia</td>
<td>17.26</td>
<td>12.38</td>
<td>6.24</td>
<td>5.47</td>
<td>9.6</td>
<td>9.15</td>
<td>9.55</td>
<td>8.72</td>
</tr>
<tr>
<td>Lithuania</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>11.77</td>
<td>9.8</td>
<td>10.02</td>
<td>12.62</td>
</tr>
<tr>
<td>Luxembourg</td>
<td></td>
<td>0</td>
<td>0</td>
<td>0.21</td>
<td>0</td>
<td></td>
<td></td>
<td>0.48</td>
</tr>
<tr>
<td>Malta</td>
<td></td>
<td>0</td>
<td>0.76</td>
<td>0</td>
<td>0.25</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Netherlands</td>
<td>0.03</td>
<td>0.03</td>
<td>0.03</td>
<td>0.03</td>
<td>0.06</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2.55</td>
<td>2.72</td>
</tr>
<tr>
<td>Portugal</td>
<td></td>
<td>0.04</td>
<td>0.06</td>
<td>0.03</td>
<td>0.03</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Republic of Moldova</td>
<td></td>
<td>6.49</td>
<td>5.71</td>
<td>6.07</td>
<td>4.02</td>
<td>4.29</td>
<td>4.16</td>
<td></td>
</tr>
<tr>
<td>Romania</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.49</td>
</tr>
<tr>
<td>*<em>Russian Federation</em></td>
<td>37.7</td>
<td>29.6</td>
<td>24.0</td>
<td>19.0</td>
<td>17.6</td>
<td>20.1</td>
<td>24.9</td>
<td>27.5</td>
</tr>
<tr>
<td>Slovakia</td>
<td>2.2</td>
<td>1.58</td>
<td>1.59</td>
<td>2.03</td>
<td>1.39</td>
<td>1.81</td>
<td>1.74</td>
<td>1.57</td>
</tr>
<tr>
<td>Slovenia</td>
<td>0.28</td>
<td>0.64</td>
<td>0.78</td>
<td>0.35</td>
<td>0.62</td>
<td>0.76</td>
<td>0.31</td>
<td>0.5</td>
</tr>
<tr>
<td>Spain</td>
<td></td>
<td></td>
<td></td>
<td>0.04</td>
<td>0.02</td>
<td>0.07</td>
<td>0.04</td>
<td>0.05</td>
</tr>
<tr>
<td>Sweden</td>
<td>0.94</td>
<td>0.44</td>
<td>0.55</td>
<td>0.45</td>
<td>0.8</td>
<td></td>
<td>1.13</td>
<td></td>
</tr>
<tr>
<td>Tajikistan</td>
<td>0.61</td>
<td>0.46</td>
<td>0.61</td>
<td>0.91</td>
<td></td>
<td>0.26</td>
<td>0.21</td>
<td>0.46</td>
</tr>
<tr>
<td>Turkmenistan</td>
<td>0.55</td>
<td>0.12</td>
<td>0.15</td>
<td>0.75</td>
<td>0.22</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>United Kingdom</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.25</td>
<td>0.26</td>
<td></td>
<td>0.24</td>
</tr>
<tr>
<td>Uzbekistan</td>
<td>0.51</td>
<td>0.54</td>
<td>0.62</td>
<td>0.63</td>
<td>0.65</td>
<td>0.37</td>
<td>0.43</td>
<td>0.55</td>
</tr>
<tr>
<td>EU-25 average</td>
<td>0.46</td>
<td>0.59</td>
<td>0.63</td>
<td>0.6</td>
<td>0.64</td>
<td>0.71</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>CIS-12 average</strong></td>
<td>10.31</td>
<td>11.99</td>
<td>11.55</td>
<td>10.84</td>
<td>9.84</td>
<td>9.94</td>
<td>10.44</td>
<td>10.96</td>
</tr>
</tbody>
</table>

**Data source:** HFA-MDB (state: June 2005)

**Russian Federation* - data source:** GOSKOMSTAT / FAIRS (state: 2002)
Table 4-2 shows autopsy rates – determined as the number of autopsies divided by the total number of deaths – in some selected countries. As follows from this table, the situation in Russia – at least for the total autopsy rate – looks better than in other countries, except for Finland. Therefore, deaths from alcohol poisonings may probably be better diagnosed in Russia than e.g., in Germany or England.

Table 4-2 Autopsy rates in selected countries

<table>
<thead>
<tr>
<th>Countries</th>
<th>Year</th>
<th>Autopsy rates</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>total</td>
</tr>
<tr>
<td>England</td>
<td>1999 (1)</td>
<td>17.3%</td>
</tr>
<tr>
<td>Germany</td>
<td>1999 (2)</td>
<td>5.3%</td>
</tr>
<tr>
<td>Sweden</td>
<td>1992 (3)</td>
<td>22%</td>
</tr>
<tr>
<td></td>
<td>1996 (4)</td>
<td>37%</td>
</tr>
<tr>
<td>Finland</td>
<td>1992 (3)</td>
<td>31.1%</td>
</tr>
<tr>
<td></td>
<td>1996 (4)</td>
<td>36%</td>
</tr>
<tr>
<td>Denmark</td>
<td>1992 (3)</td>
<td>16%</td>
</tr>
<tr>
<td></td>
<td>1996 (4)</td>
<td>32%</td>
</tr>
<tr>
<td>Norway</td>
<td>1996 (4)</td>
<td>9%</td>
</tr>
<tr>
<td>Russia</td>
<td>1999 (5)</td>
<td>35.6%</td>
</tr>
</tbody>
</table>

Sources: (1) Department of Health, United Kingdom (2001)
(2) Brinkmann et al (2002)
(3) Saukko (1995)
(4) WHO (1998)
(5) Zairat’iants (2001)

The countries of the former USSR have a common historical background, related to the organisation of forensic and pathological examination services. Therefore, we may assume that the post-mortem diagnostic practices in Belarus, Estonia or Latvia are very close to those in Russia.

However, we can not exclude the fact that the observed East-West variations in levels of alcohol poisoning mortality are at least partly artefactual – i.e. they arise due to differences in the quality of death certification procedures.

(2) The documentation of alcohol poisoning in a death certificate as the cause-of-death is based on the judgement of examiners. Attributing death by a certifying specialist to a one-and-only antecedent cause may be unambiguous when death is caused by well-defined diseases or acute injuries in well-known circumstances. If, however, death is caused by a chronic disease and/or combined with concurrent causative conditions, considerable difficulties may occur.

The medical certifier should record in the death certificate the circumstances of death, pertinent laboratory findings and other facts the certified cause-of-death diagnoses are based on. He/she should clearly indicate the main component of a whole combination for the tabulation as the underlying cause-of-death. This principle is consistent with the ICD-10 note on interpretation of cause-of-death entries: “If one component of the combination is specified as the cause-of-death, code to that component” (WHO 1993).

The nosologist at a statistical office can pay attention to the informed opinion of the death certifier. However, he or she may select the underlying chronic condition as a correct
cause-of-death for coding. For instance, if chronic alcoholism is stated on the death certificate, the statistician may ignore the fact that an alcoholic became so intoxicated that he accidentally died from ethanol poisoning, not to mention methanol and other possible surrogates for ethyl alcohol.

Therefore, the discrepancies between the information from death certificates and that in the cause-of-death statistics may result from the way physicians and nosologists interpret WHO rules and definitions.

Another example concerns cases in which a combination of alcohol and drugs, taken with a sole purpose of becoming intoxicated, has been identified. The certifier may give priority to the alcohol component, referring to the argumentation of high BAC values and the fact that the combined drug did not potentiate the toxic effect of alcohol. The statistician, however, may re-assign the underlying cause-of-death to the drug component in accordance with the WHO rule which states: “combination of medicinal agents with alcohol should be coded to the medicinal agent” (WHO 1993).

Due to the above mentioned discrepancies, alcohol poisonings were underrepresented in the official statistics of Finland by 31.4% in 1997, as compared with medico-legal statements based on forensic toxicological examinations (Lahti & Vuori 2002).

The practice of interpreting and applying the WHO instructions differs between countries. In some countries – e.g., in Greece – the official statistical authority does not wait for the results of a toxicological investigation ordered by a certifying physician, but accepts a preliminary diagnosis (Spiliopoulous 2001 p14-15).

There are also differences between coders. In a training seminar for coders in the Nordic countries, the participants had to code 135 death certificates and the internal consistence was 48 percent. A Swedish study has shown that the changes in the practice of coding across time may affect the entire mortality statistics. In this study, all statistically significant trends in mortality during the time period 1970 to 1980 were scrutinised. Half of the changes could be attributed to changes in the coding practice (Johansson 2001 p17-18).

For these reasons, any comparisons of alcohol poisoning rates across countries – as well as across time – may be associated with considerable difficulties. At present, the most popular method of comparing alcohol consequences across geographic areas still relies on liver cirrhosis – without any reference to alcohol aetiology – and psychosis morbidity and mortality statistics, as proposed many years ago by the WHO. The critical issues are, however, the following: (1) non-alcoholic cirrhoses and psychoses are not directly attributable to alcohol consumption and (2) official statistical data for these causes of death may be affected by national practices in performing autopsies and coding procedures, as discussed above for alcohol poisonings.

Further, liver cirrhoses and psychoses are assumed to be indicators of chronic alcohol-related diseases and the latter should represent indicators of acute consequences of alcohol consumption (Cipriani et al 2001). However, with the given assumption, a very important aspect of the national alcohol consumption patterns can not be properly studied. In other words, the sole information about the level of alcohol consumption in a country is insufficient to explain alcohol-related mortality. For instance, alcohol-related mortality from cirrhosis, pancreatitis, alcoholism, alcohol poisoning and psychosis almost doubled in Denmark between 1970 (15.2 per 100 000 population) and 1994 (29.5 per 100 000), even though the consumption of alcohol has been stagnating since 1983 (Rehn et al 2001 p24). Therefore, additional factors – like prevalence of binge drinking, types of beverages preferred, composition of drinking population, distribution of consumption in terms of quantity and quality etc – should be taken into account in studying of alcohol-related mortality for a more comprehensive view.
4.3 Alcohol consumption and patterns of drinking

It has been estimated that the lowest mortality risk may be achieved at a consumption level of two litres of pure alcohol per capita annually (Edwards et al 1994, cited in Rehn et al 2001 p5).

To get a picture of alcohol consumption in a country, both recorded and unrecorded consumption should be considered. Unrecorded consumption includes home production (moonshine), illicit production, black markets, border traffic, smuggling of alcoholic beverages etc. For some countries there are substantial differences in the figures of recorded and unrecorded alcohol consumption. This is particularly the case in the Eastern European former socialist countries – for instance, in Estonia, Hungary, Latvia and the Russian Federation (Table 4-3).

Table 4-3 Recorded and unrecorded (where available) alcohol consumption (in litres of pure alcohol per person per year) in 1998 for some selected countries of the WHO’s European Region

<table>
<thead>
<tr>
<th>Countries</th>
<th>Data reliability (1)</th>
<th>Recorded consumption 1998 (1)</th>
<th>Estimated unrecorded consumption (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>**</td>
<td>9.3</td>
<td>+0.7</td>
</tr>
<tr>
<td>Belgium</td>
<td>**</td>
<td>8.2</td>
<td></td>
</tr>
<tr>
<td>Bulgaria</td>
<td>*</td>
<td>6.8</td>
<td></td>
</tr>
<tr>
<td>Cyprus</td>
<td>***</td>
<td>7.0</td>
<td></td>
</tr>
<tr>
<td>Czech Republic</td>
<td>**</td>
<td>10.8</td>
<td></td>
</tr>
<tr>
<td>Denmark</td>
<td>***</td>
<td>9.5</td>
<td>+1.9</td>
</tr>
<tr>
<td>Estonia</td>
<td></td>
<td>2.5</td>
<td>+6.0</td>
</tr>
<tr>
<td>Finland</td>
<td>***</td>
<td>7.1</td>
<td>+2.0</td>
</tr>
<tr>
<td>France</td>
<td>**</td>
<td>10.8</td>
<td>+0.9</td>
</tr>
<tr>
<td>Germany</td>
<td>***</td>
<td>10.6</td>
<td></td>
</tr>
<tr>
<td>Greece</td>
<td>*</td>
<td>7.9</td>
<td>+1.5</td>
</tr>
<tr>
<td>Hungary</td>
<td>*</td>
<td>10.2</td>
<td>+10.1</td>
</tr>
<tr>
<td>Ireland</td>
<td>**</td>
<td>9.7</td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td>***</td>
<td>7.7</td>
<td>+0.4</td>
</tr>
<tr>
<td>Latvia</td>
<td>*</td>
<td>7.1</td>
<td>+14.2</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>**</td>
<td>13.3</td>
<td></td>
</tr>
<tr>
<td>Malta</td>
<td>*</td>
<td>5.1</td>
<td></td>
</tr>
<tr>
<td>Netherlands</td>
<td>***</td>
<td>8.1</td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td>**</td>
<td>4.2</td>
<td>+1.42</td>
</tr>
<tr>
<td>Portugal</td>
<td>*</td>
<td>11.3</td>
<td></td>
</tr>
<tr>
<td>Romania</td>
<td>**</td>
<td>10.7</td>
<td></td>
</tr>
<tr>
<td>Russian Federation</td>
<td>*</td>
<td>7.9</td>
<td>+7.5</td>
</tr>
<tr>
<td>Slovakia</td>
<td>*</td>
<td>8.0</td>
<td></td>
</tr>
<tr>
<td>Spain</td>
<td>**</td>
<td>10.1</td>
<td></td>
</tr>
<tr>
<td>Sweden</td>
<td>*</td>
<td>4.9</td>
<td>+0.6</td>
</tr>
<tr>
<td>Ukraine</td>
<td></td>
<td>0.7</td>
<td>+11.5</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>**</td>
<td>8.0</td>
<td></td>
</tr>
</tbody>
</table>

**Sources:** (1) WARC (2002 p9)

Data reliability:

*** very reliable data
** reliable data
* less reliable data

Recorded consumption: total sales in litres of pure alcohol divided by the total mid-year population

(2) Rehn et al (2001 p6)
In the framework of the European Comparative Alcohol Study, an attempt has been made to estimate levels and trends of unrecorded consumption for 13 old member states of the European Union and Norway. The result was that the share of unrecorded consumption varies between countries, but also over time (Leifman 2001a).

According to both recorded and unrecorded levels of alcohol consumption, the countries of the WHO European Region (Rehn et al 2001 p7) were arbitrarily divided in three groups. The group with a high level of consumption – more than 10 litres per person annually – includes Czech Republic, Denmark, France, Germany, Greece, Hungary, Ireland, Latvia, Lithuania, Luxembourg, Portugal, the Republic of Moldova, the Russian Federation, Slovenia, Spain, the Former Yugoslav Republic of Macedonia and Ukraine.

The low-consumption-group – less than 5 per person per year – consists of Azerbaijan, Israel, Kyrgyzstan and Turkey. The remaining countries – Belgium, Bulgaria, Finland, Greece, the Netherlands and United Kingdom – constitute the middle-consumption-group.

When working with national and international data on alcohol consumption, researchers are faced with the problem of data comparability and reliability. Obviously, recorded alcohol consumption for many countries – including the Russian Federation, Estonia, Hungary etc – does not reflect a realistic national consumption. Moreover, the estimated figures of unrecorded consumption should also be treated with caution for different countries, since they are based on different evaluation methods (Rehn et al 2001 p5). In the European Comparative Alcohol Study (ECAS) authors came to the conclusion that all estimates of the volume of unrecorded consumption are inaccurate, and the degree of inaccuracy varies over time and across countries (Simpura 2001).

Since we can not exactly establish – and compare – the levels of alcohol consumption, alternative approaches should be considered for dealing with the issue of alcohol-related mortality. Recently, more and more voices are heard in the research literature, insisting that drinking patterns could matter more than the mere level of consumption. Basically, anything beyond the mere consumption volumes – per capita, on average – should be regarded as “patterns”. In studying of drinking patterns, different indicators can be used – for instance, beverage preferences, frequency of drinking and abstinence rates, prevalence of binge drinking etc.

With respect to beverage preferences, studies are usually based on recorded consumption data for beer, wine or spirits. Other types of data – frequency of drinking, abstinence rates, occasions of heavy intake etc – are mostly obtained through questionnaire studies.

Traditionally, Mediterranean wine-drinking countries, Central European beer-drinking countries and spirits-drinking countries of Northern Europe were distinguished in the literature.

Baltic or Nordic spirits-drinking countries – including Russia – as well as Ireland and the United Kingdom were often regarded as having a “wet” drinking culture. That is, episodic excessive consumption of strong alcoholic beverages leading to intoxication – termed otherwise as binge drinking – is quite common, the rate of abstainers is low, and the majority of women also drink alcohol.

In a “dry” drinking culture, which is typical for the Mediterranean countries, wine is an integral part of the diet. Nevertheless, drinking to intoxication is regarded as socially unacceptable. In these countries, there is a higher prevalence of abstainers. It should be, however, mentioned that some of the wine-drinking countries use different definitions to measure abstainer rates in surveys. In Italy, for instance, people are regarded as abstainers if they have had less than one unit of alcohol during the previous three months. In the majority of surveys carried out in the European countries, people are defined as abstainers, if they have not had any alcohol during the previous 12 months.
In the period from 1950 onwards, the dominating beverage lost some of its popularity in each group of countries. A homogenisation – or convergence – of beverage preferences has been noted virtually for all European countries. Homogenisation is often discussed in relation to another frequently used term, that is, globalisation. Other related terms in use include modernisation and internationalisation. The terms embrace the basic idea that the world is shrinking, and that one likely consequence of this process – though not automatically – is convergence, standardisation or harmonisation between countries or regions in different spheres of life, including preferences of alcoholic beverages (Leifman 2001b).

The WHO experts examined 27 countries within the WHO European Region. In accordance with the beverage preferences for 1998, these countries have been divided in three groups (Rehn et al 2001 p11):

**Beer:** Austria, Belgium, the Czech Republic, Denmark, Finland, Germany, Ireland, Luxembourg, the Netherlands, Slovakia and the United Kingdom;

**Wine:** Austria, Denmark, France, Greece, Hungary, Italy, Luxembourg, Portugal, Spain and Switzerland; and

**Spirits:** Bulgaria, France, Greece, Hungary, Latvia, Poland, Romania, Russia, Slovakia, and Spain.

A country has been determined as belonging to a definite group, if its recorded consumption exceeded the regional average for a particular beverage category. Some countries fit into more than one group – like Austria, Denmark, France, Greece, Hungary, Luxembourg, Slovakia and Spain. In Iceland, Malta, Norway and Sweden, the consumption of the different beverages is so low and equally distributed that these countries do not clearly belong to any one group.

This picture may testify to a continuing convergence of beverage preferences. Many wine countries are reducing overall consumption; if they drink more, it is most likely to be beer. By contrast, beer countries drink in average more wine. Finally, spirits countries – including Russia – are drinking more spirits and/or beer. This conclusion should be regarded as very general and cautious, as the WHO experts have analysed trends in recorded alcohol consumption only for one decade since 1988.

In evidence of this idea, the European Comparative Alcohol Study (ECAS) analysed aggregate data on alcohol consumption for 14 EU member states and Norway from 1950 to 1995. The researchers identified a clear homogenisation in beverage preferences. In terms of quantity, the homogenisation is less distinct and can be explained mainly by a drastic reduction in wine consumption in the Mediterranean wine-drinking countries. However, in the beer and spirits-drinking countries, there has not been any quantitative homogenisation from the mid-1970s onwards (Leifman 2001b).

In order to obtain the full picture of drinking patterns, we have to review the discussions on binge drinking. This indicator is of a particular relevance for this research paper, since it is clearly related to deaths in a state of alcoholic intoxication, including fatal alcohol poisonings.

In Table 4-4, we present the estimates of “binge drinking prevalence” in some selected countries. These estimated are based on national survey data.

There are, basically, two ways to measure binge drinking in surveys. The so-called “subjective questions” contain expressions like “intoxication” or “feeling the effects”. These are terms that may be culturally familiar in some countries but unfamiliar in others. Therefore, there is a recommendation to develop standardised measures for various aspects of drinking patterns in epidemiological studies (Rehm et al 1996).
<table>
<thead>
<tr>
<th>Country</th>
<th>Year</th>
<th>All (%)</th>
<th>Men (%)</th>
<th>Women (%)</th>
<th>Definitions</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>mid-1990s</td>
<td>15%</td>
<td>-</td>
<td>-</td>
<td>Subjective assessment: drunk at least once during the last 12 months</td>
<td>Guilbert et al (1997), cited by Simpura &amp; Karlsson (2001)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Age: 18+</td>
<td></td>
</tr>
<tr>
<td>Greece</td>
<td>1998</td>
<td>-</td>
<td>14%</td>
<td>2%</td>
<td>≥ 5 drinks at least three times during the previous month</td>
<td>Trends in Alcohol Use ... (1999), cited by Simpura &amp; Karlsson (2001)</td>
</tr>
<tr>
<td>Italy</td>
<td>1990s</td>
<td>1.2%</td>
<td>-</td>
<td>-</td>
<td>At least two episodes of drunkenness (objective measure) during the last three months Age: 14+</td>
<td>Gli Italiani e l'alcool/The Italians and alcohol, (1998), cited by Simpura &amp; Karlsson (2001)</td>
</tr>
<tr>
<td>Denmark</td>
<td>1989</td>
<td>-</td>
<td>16%</td>
<td>8%</td>
<td>Drunk so much at least a couple of times a month as to become inebriated</td>
<td>Sabroe &amp; Rasmussen (1995:348), cited by Simpura &amp; Karlsson (2001)</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>1996</td>
<td>-</td>
<td>37%</td>
<td>-</td>
<td>≥ 5 units in one drinking session at least once a week</td>
<td>General Household Survey (1996), cited by Simpura &amp; Karlsson (2001)</td>
</tr>
<tr>
<td>Norway</td>
<td>1996</td>
<td>-</td>
<td>8.8%</td>
<td>2.9%</td>
<td>≥ 6 drinks per occasion</td>
<td>Mäkelä et al. (1999:40), cited by Simpura &amp; Karlsson (2001)</td>
</tr>
<tr>
<td>Sweden</td>
<td>1998</td>
<td>-</td>
<td>14%</td>
<td>3.5%</td>
<td>≥ 6 glasses per occasion at least once a month</td>
<td>Drogutvecklingen i Sverige (2000), cited by Simpura &amp; Karlsson (2001)</td>
</tr>
<tr>
<td>Estonia</td>
<td>1999</td>
<td>11%</td>
<td>-</td>
<td>-</td>
<td>≥ 5 alcohol units on the last drinking occasion during the last month</td>
<td>Brunovskis &amp; Ugland 2002</td>
</tr>
<tr>
<td>Latvia</td>
<td>1999</td>
<td>13%</td>
<td>-</td>
<td>-</td>
<td>≥ 5 alcohol units on the last drinking occasion during the last month</td>
<td>Brunovskis &amp; Ugland 2002</td>
</tr>
<tr>
<td>Lithuania</td>
<td>1999</td>
<td>16%</td>
<td>-</td>
<td>-</td>
<td>≥ 5 alcohol units on the last drinking occasion during the last month</td>
<td>Brunovskis &amp; Ugland 2002</td>
</tr>
<tr>
<td>Russia</td>
<td>1996</td>
<td>31%</td>
<td>5%</td>
<td></td>
<td>≥ 25 cl of vodka at one occasion at least once a month; age 18+</td>
<td>Bobak et al (1999)</td>
</tr>
</tbody>
</table>
An attempt to quantify binge drinking encompasses “objective questions”. The “objectivity” of this approach lies in the assumption of the respondents knowing when they have consumed more than five or six drinks or units per occasion. With this definition, two fundamental problems arise. One of them is cultural inequivalence – i.e. different understanding of “drinks”, “units” and “occasions” in different cultures (Simpura & Karlsson 2001). Another problem relates to a contextual interpretation: This definition does not necessarily indicate problem drinking, since it does not take into account the time span during which the drinking has taken place or the body weight of a respondent (Brunovskis & Ugland 2002).

Therefore, the international data available on binge drinking from surveys are hardly comparable. The main reasons are:

1. different measures used in surveys,
2. different cultural interpretation of these measures,
3. variations in accuracy of reporting and
4. usual difficulties because of sampling and data collection techniques.

The heaviest drinkers – i.e. those whom we are most concerned when discussing binge drinking and its consequences – are likely to be disproportionately absent from surveys. The prevalence of the heaviest drinkers may vary in different countries and even in the same country across time, since it might depend on socio-economic conditions and their changes.

For these reasons, we believe that researchers should not expect “too much” from the information on “binge drinking” collected in surveys. It is unlikely that surveys measure the real prevalence of binge drinking in a given country. These data on “binge drinking” reflect, probably, attitudes of respondents towards alcohol intoxication – or towards an intake of definite amounts of alcohol.

What do we basically learn from these surveys? Despite the limitations concerning the accuracy of prevalence estimates, surveys provide valuable information on a societal tolerance of specific drinking patterns. The drinking behaviour prevailing in survey respondents – and in well-socialised country residents – may have a significant impact on diagnostic and coding practices. If binge drinking is widely recognised and “appreciated”, certifiers will be less likely to avoid “disgraceful” alcohol-related diagnoses.

### 4.4 Alcohol in Russia – implications of “hard” and “soft” data

Above, we reviewed the issues of validity and reliability for “hard” and “soft” alcohol-related data – i.e. mortality statistics and levels/patterns of consumption. What are the implications of these data for Russia?

First, since autopsy rates are high, diagnostic assessment of “unnatural” death causes is likely to be valid and reliable (Zairat'iants 2001). This refers to all causes of death analysed in this paper, including accidental poisoning by alcohol. The organisation of forensic and general pathology services – as well as post-mortem diagnostic practices – did not undergo significant changes within the time span analysed. Therefore, an artefactual increase or decrease of death rates can probably be excluded.

It should, however, be noted that mortality rates may be biased in some regions of Russia. This may happen due to a denominator bias – i.e. unreliable population estimates because of the armed conflict (Chechnya) or as a consequence of large refugees’ inflows (Ingush Republic). In addition, we can not exclude a numerator bias in these regions due to the under-registration of death cases. Such regions should be excluded from analyses.
Second, the levels of alcohol-related mortality are very high in the Russian Federation. In Moscow, where the total autopsy rates are amount to 43-48 percent for 1996-2000, chronic and acute organ damages due to alcohol represent the third important underlying cause of death after diseases of the circulatory system and neoplasms (Zairat’iants 2001).

A frequent documentation of alcohol-related death causes may witness to highly tolerant attitudes towards heavy binge drinking in the Russian society.

Another important implication of the enormously high levels of alcohol-related mortality is a “marginalisation” of society. If serious socio-economic problems bring about a massive increase in the share of marginalised heavy drinkers – and in alcohol-related mortality – this fact will probably be first of all noticed by certifying physicians and forensic experts.

Therefore, official statistics of alcohol-related deaths may represent a sensitive indicator of:

(a) societal tolerance of heavy binge drinking and
(b) share of marginalised never-do-well alcoholics reflecting serious socioeconomic problems in the given society.

Third, the prevalence of “binge drinking” seems to be high among the survey respondents (Bobak et al 1999). Nearly one-third of Russian men can drink a glass of vodka or more at one “occasion” at least once per month. This is an additional “soft” argument in support of highly tolerant attitudes towards drinking of strong alcoholic beverages in relatively big amounts.

However, the “dry” cultures of the North Caucasus are basically characterised by lower acceptance of binge drinking and drunkenness. These differences should be taken into account in the models of regional alcohol poisoning mortality.

Fourth, the recorded level of alcohol consumption does not reflect the reality for Russia. Some scholars believe that the real level of alcohol consumption in Russia is the highest in the world (Pridemore 2004).

Nemtsov (2002) estimated the peak of alcohol consumption in Russia in 1994 as follows: 14.6 litres of pure alcohol per capita for the total population and 18.5 litres for adults (ages 15+).

For the sake of comparison, we indicate the 1994 figures on total alcohol consumption in some industrialised countries, in litres of pure alcohol per capita (WARC 2002):

<table>
<thead>
<tr>
<th>Country</th>
<th>Litres of Pure Alcohol per Capita</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>11.4</td>
</tr>
<tr>
<td>USA</td>
<td>6.7</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>7.7</td>
</tr>
</tbody>
</table>

Nemtsov’s estimates are based on trends of alcohol poisoning mortality. The author believes that the upsurge in alcohol-related mortality can be largely explained by the increased consumption of toxic counterfeits. Their proportion in the overall consumption amounted to 30.4-67.2 percent. Nemtsov points out that the mortality excess – as well as alcohol consumption – should not be extended to the total population, since people “who existed at a lower social level” and died from alcohol poisonings chose primarily cheaper and, therefore, more toxic spirits.

Fifth, there is a wide-spread practice of employing alcohol poisoning deaths as proxy for binge drinking in Russia and in other transition countries (Chenet et al 2001). The number of alcohol poisoning deaths significantly increases during the weekends – as a result of heavy binge drinking sessions (Pridemore 2004). This indicator is often used to classify deaths due not only to acute poisoning but also to the underlying effects of chronic alcoholism (Blum & Monnier 1989; Shkolnikov & Meslé 1996 p113-162).

What conclusions can be drawn from the evidence discussed in this subsection? Basically, they refer to the “ecological role” of alcohol poisoning mortality in Russia, which can be tentatively
4.5 Accidental poisoning by alcohol and its determinants

4.5.1 Alcohol quantity

Alcohol depresses the nervous system, beginning to act at the lowest concentration upon the higher centres of cerebral cortex. It affects the lower centres of the central nervous system only when blood alcohol concentration becomes higher. Deaths occur due to an overdose causing severe suppression of vital centres in the brainstem responsible for respiration and heartbeat.

The amount of alcohol it takes to affect the central nervous system depends on multiple factors including body size and weight, degree of hydration etc. Rapid consumption of large quantities of alcohol can overload the liver’s metabolic capacity, causing the BAC to rise rapidly.

Alcohol taken into an empty stomach will be absorbed into the bloodstream more rapidly. Therefore, heavily sick alcoholics with the lack of proper diet are particularly at risk of rapid reaching high BACs. At BACs of 0.25 to 0.40 grams per decilitre, alcohol poisoning can lead to slurred speech, in-coordination (ataxia), stupor, coma and, finally, to death (Seller & Kalant 1976; Poikolainen & Vuori 1985). At BACs exceeding 0.40 grams per decilitre, respiratory and heartbeat centres are considerably depressed and coma or death may occur.

Large variations in high BAC levels tolerance have been observed: Experienced drinkers can tolerate much higher BAC levels than inexperienced drinkers (Yoon et al 2003; Heatley & Crane 1990). On the other hand, an unaccustomed drinker usually does not reach a lethal BAC.

4.5.2 Alcohol quality

The current incidence and patterns of alcohol poisoning mortality in different population groups are not well understood. However, it is clear that the excessive drinking is not the sole cause of alcohol poisoning deaths. Alcohol quality plays a very important role. Dashes of extremely toxic substances – like methyl or isopropyl alcohol – increase ethanol toxicity (Yoon et al 2003). Lethal cases have been often reported in people drinking purified alcohol surrogates, such as antifreeze, solvents for gums and lacquers, fixatives and perfumes etc.

4.5.3 Alcoholism

There is a popular belief that accidental alcohol poisoning death is more prevalent in younger than older people – because of childish curiosity, behavioural experimentation of teenagers or self-affirmation of young adults. Contrary to this belief, the death rate from this cause is highest at ages 45 to 54 in the USA (Yoon et al, 2003).

The age distribution of fatal alcohol poisonings in the Russian Federation indicates that death rates peak at age of 40-59 years, due to excessive mortality in men (Figure 4-1). In 1990-2001, the males-to-females mortality ratio fluctuates in the range of 3.8-4.5. In females the highest mortality rates are observed at age of 50-59 years (Figure 4-2).

Probably, the majority of deceased suffered from chronic alcoholism. Series of studies identified the crucial role of chronic alcoholism in fatal alcohol poisonings: it has been shown that inexperienced drinkers rarely reach a lethal level of BAC (Lahti & Vuori 2002). Obviously, in the most cases, acute alcohol poisonings were not that “accidental”, since the average age at death lets us...
CONCEPTUAL MODELS – (B) ALCOHOL

assume that deceased had a considerable length of heavy binge drinking experience, sufficient to develop alcohol dependence syndrome.

Figure 4-1 Age distribution of male mortality due to accidental poisoning by alcohol, Russian Federation

Figure 4-2 Age distribution of female mortality due to accidental poisoning by alcohol, Russian Federation

*Data source:* GOSKOMSTAT / FAIRS (state: 2002)

The ICD-10 Classification of Mental and Behavioural Disorders (WHO 1992) defines alcohol dependence syndrome as a cluster of physiological, behavioural, and cognitive phenomena in which use of alcohol takes on a much higher priority for a given individual than other behaviours that
once had greater value. Thus, in persons affected, there is a development of characteristic deviant behaviours with prolonged consumption of excessive amounts of alcohol.

A strong desire – compulsion – to consume alcohol dominates over alternative pleasures or interests; social and working obligations may be neglected. This compulsion leads to narrowing of the personal behavioural repertoire. Alcoholics spend a great deal of time for using alcohol or recovering from hangovers. Despite serious alcohol-related physical or psychological problems – even if they are well recognised by alcoholics – harmful drinking is continued.

One of the most important features of this deviant behaviour is difficulty in controlling of alcohol-taking in terms of frequency, levels of use and even quality of beverages. A wide-spread use of cheap alcohol surrogates – such as different kinds of spirits for technical needs – and toxic counterfeits has been reported by psychiatric in-patients hospitalised with severe generalised alcoholic seizures and psychoses in the mid-90s. Later, these “beverages” were eliminated from the consumer market. However, in the mid-90s, they were available in Russian cities virtually “at each corner”.

Surprisingly, they matched taste preferences of a definite low-income target group – men at ages 40-45 hospitalised with delirium tremens, Korsakoff’s psychosis and comorbid alcohol-related health problems – “better than vodka or moonshine: strong, sweet and with a nice taste”. These alcoholics were mostly unemployed and low-skilled, never married or with unstable partnerships, many of them were homeless, some of them had problems with the law. These empirical observations of high-risk-group from psychiatric practice are consistent with the study results from Finland (Poikolainen & Vuori, 1985) and the United States (Yoon et al 2003), reporting that the risk of fatal alcohol poisoning differed by marital status and was inversely related to socio-economic status.

4.5.4 Alcohol availability and prices

Since it is assumed that persons at increased risk of fatal alcohol poisoning mostly belong to a very sick population of marginalised chronic alcoholics, there should be some specific factors for alcohol reinforcement, acting in this population.

There is evidence from experimental studies showing that the symptoms of compulsion are cognitively influenced (O’Brien et al 1998). Environmental stimuli associated with subjective effects of ethanol may become conditional stimuli that evoke compulsive desire of alcohol intake.

As a consequence, both sight and odour of alcoholic beverages can elicit increased desire to drink and even subjective experience of withdrawal symptoms. Therefore, wide availability and cheapness of alcohol may not only act as conditional stimuli, they might also represent a considerable risk factor for alcohol poisoning deaths in a heavily dependent population.

On the other hand, demand creates supply. Consequently, availability and prices of alcoholic beverages may depend on the prevalence of chronic alcoholics in a given population.

4.5.5 Stress versus marginalisation?

Abundant clinical and experimental evidence demonstrates that physical, social and emotional stress can facilitate initiation and maintenance of alcohol abuse and dependence, as well as precipitation of relapse (Marlatt 1985 p3-70; Suwaki et al 2001). Thus, ethanol use can be regarded as a form of self-medication for stress-related emotional and physical discomfort.

However, it is likely that a set of stressors may be different for three types of drinkers: those who just begin their alcoholic careers, those who are at risk of relapse after a period of abstinence

11 author's observation
and, finally, those marginalised “never-do-well alcoholics” who are especially at risk of dying from alcohol poisoning. The last category of alcohol-users has been investigated in epidemiological studies least of all – probably, due to difficulties of recruiting and follow-up or even due to lacking research interest. For these reasons, one may only speculate about the relationships between stress and alcohol poisonings, since they were never properly examined.

The assumption that alcohol poisoning mortality may reflect the share of marginalised “never-do-well alcoholics” in Russian regional populations appears to be more plausible. Heavily alcohol-dependent binge drinkers are most likely to drift to the marginalised population strata at the very bottom of the societal hierarchy. Marginality – defined in the broader sense as “not quite belonging in one world of the other” (Berry 1976 p66-67) – is closely linked with the sociological concept of anomie (Durkheim 1897) and the psychological concept of alienation (Seeman 1959).

Anomie – or normlessness – characterizes a social condition, in which there is lack of cohesion and order, especially in relation to norms and values (Johnson 2000 p14).

Alienation – or estrangement – is conceptualised as a psychological condition of “broken integrity” which refers to the sense of self (Johnson 2000 p10). In other words, it is a separation between parts of the whole of the personality and crucial aspects of the world of experience, including close relationships, societal norms and values, social roles, attachment to communities etc.

In anomic conditions, people tend to feel incapable to shape and transform their environments. They are isolated, disconnected from others, themselves and the meaningful work in which they can express themselves. Control theory asserts that the opposite of alienation and isolation – namely, social ties binding people to conforming society – prevents individuals from heavy binge drinking and other types of deviant behaviour (Hirschi 1969).

We assume marginalisation to represent an extreme form of alienation and social isolation. If this assumption is correct, we would expect to observe an aggregate-level association between alcohol poisoning mortality and the “classical” measures of social isolation, alienation and anomie – e.g., divorces, abortions, as well as unemployment and crime rates.

4.5.6 Societal tolerance of heavy binge drinking

The rates of fatal alcohol-related outcome in Russian administrative areas may – at least partly – depend on societal tolerance of heavy binge drinking. More tolerant attitudes may be present in the regions, in which the population experiences a greater magnitude of rapid unfavourable changes in economic environment – such as massive financial losses, growing economic inequality etc.

In such regions, marginalised never-do-well alcoholics may be treated by the better socialised people as unfortunate victims deserving charity and compassion rather than blaming. Therefore, a wide acceptance of “drowning sorrows and misery in alcohol” can probably reinforce excessive alcohol consumption in marginalised heavy binge drinkers.

4.5.7 Rapid unfavourable changes in economic environment

This particular determinant of alcohol poisoning mortality is likely to express its impact in two ways. As stated above, it may stimulate the societal tolerance of heavy binge drinking. From the other hand, it is directly linked with anomie (Durkheim 1897) and, thereby, with marginalisation.

4.5.8 Drinking habits of the regional populations

Drinking habits can vary by ethnic groups. We have already mentioned negative attitudes to binge drinking and drunkenness in the cultures of the North Caucasus. In addition, it is necessary
to take into account the differences observed by urban/rural settings, since alcohol poisoning mortality is a predominantly rural phenomenon in Russia. Finally, drinking habits may significantly vary by educational background of the regional populations.

4.6 Conceptual summary

Let us summarise the discussions on fatal alcohol poisonings and draw some conclusions for the econometric modelling.

Taken as independent variable, alcohol poisoning mortality can be used as an approximation of heavy binge drinking – for instance, in a cross-sectional time series analysis of panel data for the regions of the Russian Federation.

When we treat alcohol poisoning mortality as a dependent variable, we must be aware of its “ecological role”. At the aggregate level, this particular cause of death serves as a sensitive indicator for the share of marginalised heavy drinkers – never-do-well alcoholics – in a given society. Scheme 4-1 illustrates a conceptual framework for the development of explanatory models of alcohol poisoning mortality.

Scheme 4-1 Conceptual framework for the aggregate-level modelling of alcohol poisoning mortality

The given approach incorporates the determinants of alcohol poisoning mortality which are considered to be crucial for its “ecological role”. As follows from Scheme 4-1, there are complex interrelationships between some of the concepts. For instance, availability and prices of alcohol and its surrogates can influence the incidence of fatal alcohol poisonings. Vice versa, the prevalence of marginalised “never-do-well” alcoholics in a given population may determine the demand for cheap low-quality beverages, increasing, therefore, their supply.
Table 4-5 provides an extension to this framework, suggesting measures – or their approximations – for the relevant concepts.

**Table 4-5 Conceptual approach to the aggregate-level modelling of alcohol poisoning mortality in Russian regions: measures (or proxies) suggested**

<table>
<thead>
<tr>
<th>Concepts</th>
<th>Aggregate-level measures (or proxies) for Russian regions</th>
<th>Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>share of marginalised “never-do-well alcoholics”</td>
<td>accidental poisoning by alcohol, SDR per 100 000 residents</td>
<td>yes</td>
</tr>
<tr>
<td>marginalisation</td>
<td>extreme form of alienation and social isolation</td>
<td>see anomie, alienation, social isolation</td>
</tr>
<tr>
<td>anomie, alienation, social isolation</td>
<td>e.g., divorce rates, crime rates, abortions, unemployment rates</td>
<td>yes</td>
</tr>
<tr>
<td>rapid unfavourable changes in economic environment</td>
<td>e.g., financial losses of the population (approximated by mean private savings, per capita)</td>
<td>yes</td>
</tr>
<tr>
<td>societal tolerance of heavy binge drinking</td>
<td>indirect assessment via magnitude of rapid unfavourable changes in economic environment</td>
<td>see rapid unfavourable changes in economic environment</td>
</tr>
<tr>
<td>Drinking habits:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. by urban/rural settings</td>
<td>1. e.g., degree of urbanisation in regions</td>
<td>yes</td>
</tr>
<tr>
<td>2. by ethnic groups</td>
<td>2. e.g., ethnic composition of population</td>
<td></td>
</tr>
<tr>
<td>3. by educational background</td>
<td>3. e.g., rate of graduate specialists with a university (or equivalent) degree</td>
<td></td>
</tr>
<tr>
<td>availability and prices of alcohol and its surrogates</td>
<td>e.g., regional volumes of sales (per capita) for different types of alcoholic beverages and spirits for technical needs, by price categories</td>
<td>no</td>
</tr>
</tbody>
</table>

As follows from Table 4-5, some of the concepts require an indirect measurement. For instance, societal tolerance of heavy binge drinking can be assessed via variables indicating the presence of rapid unfavourable changes in economic environment. Therefore, these explanatory variables will have a complex meaning.

Rapid changes in economic environment are assumed to have a direct impact on anomie. If these associations are strong, our explanatory model of alcohol poisoning mortality may have a potential source of multicollinearity, because some of the independent variables – proxies of anomie and rapid unfavourable changes in the economic environment – may be highly correlated. Therefore, prior to the running of regression models, a careful examination of multicollinearity should be carried out.

Some important explanatory variables may be missing in our model – particularly those characterising availability and prices of alcoholic beverages, moonshine and toxic counterfeits. It is difficult to expect that valid and reliable data are available for all of the regional areas – even for the national level, the data reliability is questionable. However, this concept can not be ignored. The main argument in support of its essential role is the temporal coincidence of the Soviet anti-alcohol campaign (1985-1988) and the drastic reduction of alcohol poisoning mortality (Meslé et al 1996).
CHAPTER 5 – EXPLANATORY ECONOMETRIC MODELS
5.1 Introduction

In the previous chapters, we elaborated conceptual models of stress- and alcohol-related mortality. Now these concepts should be tested on regional panel data for the Russian Federation. We develop the “best fitting” explanatory models of suicide, homicide and alcohol poisoning mortality.

For the behavioural stress outcomes – suicide and homicide – we investigate basically the effects of three sets of explanatory variables, namely those assumed to represent:

(a) the core transition-related stressors;
(b) coping – survival strategies of the population during the protracted economic crisis and
(c) the “classical determinants of mortality” – or aggregate-level stress moderators.

The impact of the first two sets of variables has not been properly studied in the research literature. Since the conditions approximated by these variables act at the population level, an aggregate-level approach is fully legitimated. In this respect, our basic research question is whether there will be significant relationships between these sets of explanatory variables and the behavioural stress outcomes – suicide and homicide death rates.

As for the “classical determinants”, their relationships with the outcomes of interest have been examined both in individual-level and aggregate-level studies. Now we should explore their significance in Russian regional settings.

Above, we assumed that non-impulsive suicide and non-premeditated homicide are aetiologically different, since they manifest at different stress stages. Therefore, the “best fitting” models of these stress outcomes will probably be characterised by:

– slightly different sets of regressors and/or
– different strength of relationships between the common regressors and the outcomes of interest.

In particular, we expect a significant and strong association of suicide death rates with variables indicating the presence of economic “passivity” of the regional populations. Lack of opportunities to improve living standards via economic activities is typical for the economically depressed industrial and agricultural regions. Therefore, we expect suicide rates to be significantly associated with volume of agricultural and industrial production.

By contrast, homicide death rates would probably be better explained by “risks related to economic activities of the population”.

For fatal alcohol poisonings, we examine the effects of two big groups of factors:

(a) drinking habits of the regional populations and
(b) marginalisation-related processes in the regional societies.

Drinking habits are assumed to be sufficiently represented by the regional degree of urbanisation, “education” and ethnic composition of the regional populations.

Marginalisation-related processes will include the variables indicating the presence of (1) rapid unfavourable changes in the regional economic environment and (2) anomie, alienation and social isolation. Such conditions can precipitate the drift of heavily alcohol-dependent individuals to the marginalised strata at the very bottom of the societal hierarchy and increase their risks of fatal alcohol poisonings.

We intend to test our hypotheses by means of pooled cross-sectional time series analysis. This econometric technique is particularly suitable for the so-called panel – longitudinal – data, which mean in the given context a cross-section of region-specific data pooled in time series over the calendar years 1990-2001. The main advantage of a panel approach refers to its opportunity to
combine simultaneously both the space and time domains of the populations studied. Despite its increasing popularity in the theoretical and applied econometric literature, this approach is still quite uncommon in the epidemiologic research.

5.2 Variables and data transformations

We used annual data on cause-specific mortality and explanatory variables, which have been mostly derived from official statistical sources for 1990-2001. Due to the problems of data quality, twelve “atypical” areas with incomplete data or low population size were excluded from the modelling. Therefore, we analysed a set of 77 administrative areas (regions) of the Russian Federation covering the time period of 12 years. The complete list of regions analysed and excluded is given in Table 2-4 (Chapter 2).

5.2.1 Dependent variables

We construct separate models for homicide, suicide and alcohol poisoning mortality, utilising cause-specific figures, age-adjusted by the European population (per 100 000 inhabitants). These figures are derived from the original data basis FAIRS (Factographic Automated Information Reference System Potential), which comprises regional data on mortality and population from official state statistical sources (GOSKOMSTAT). Table 5-1 gives the exact definition of the dependent variables. Above, we discussed the issues of data quality for the selected causes of death. In sum, we deal with valid and reliable data, which definition – as well as the procedure of data reporting – did not undergo considerable changes within the time span analysed.

Table 5-1 Definition of dependent variables

<table>
<thead>
<tr>
<th>Cause of death, (Variable abbreviation)</th>
<th>GOSKOMSTAT codes</th>
<th>ICD-9 code</th>
<th>ICD-10 code</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1989-1998</td>
<td>since 1999</td>
<td></td>
</tr>
<tr>
<td>homicide and injury purposely inflicted by other person (homi)</td>
<td>174</td>
<td>250</td>
<td>E960.0-E969.9, X85.0-X99.9, Y00.0-Y09.9</td>
</tr>
<tr>
<td>suicide and self-inflicted injury (sui)</td>
<td>173</td>
<td>249</td>
<td>E950.0-E959.9, X60.0-X84.9</td>
</tr>
<tr>
<td>accidental poisoning by alcohol (alcp)</td>
<td>163</td>
<td>247</td>
<td>E860.0-E860.9, X45.0-X45.9</td>
</tr>
</tbody>
</table>

5.2.2 Independent variables

The details on variables computation are given in methodological comments. We present a tabulated overview of the explanatory and auxiliary variables by the following areas (Table 5-2, A-G):

(A) demographic indicators,
(B) social conditions,
(C) economic indicators,
(D) labour market situation,
(E) living conditions and welfare,
(F) climatic conditions and
(G) miscellaneous (trend variables etc).
### A. Demographic Indicators

<table>
<thead>
<tr>
<th>Variable (name)</th>
<th>Definition, Units, Transformation (if performed) Comments</th>
<th>Data Sources</th>
<th>Time coverage, periodicity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midyear population ((mpy))</td>
<td><strong>Definition</strong>: Estimate of resident ((de \ jure)) population on 1 July of a given calendar year. It is calculated as an average of end-year estimates. <strong>Unit</strong>: Numbers of persons, by regions <strong>Comments</strong>: (mpy) is as an auxiliary variable, providing the denominator to calculate some explanatory variables.</td>
<td>FAIRS</td>
<td>1990-2001, annually</td>
</tr>
<tr>
<td>Urbanisation ((urb))</td>
<td><strong>Definition</strong>: Share of urban population <strong>Unit</strong>: Percent, by regions <strong>Comments</strong>: Missing values for 1990 are replaced by the figures of 1991. Figure 5-1 shows minor changes in urbanisation across time.</td>
<td>GOSKOMSTAT (2002); Practical Science Database/Russia in Figures (2004)</td>
<td>1991-2001, annually</td>
</tr>
<tr>
<td>Divorces ((div))</td>
<td><strong>Definition</strong>: Divorce rate (for divorces reported by civilian registry offices) <strong>Unit</strong>: Rates per 1000 inhabitants, by regions <strong>Comments</strong>: Figure 5-2 illustrates the dynamics of mean divorce rates in the regions analysed</td>
<td>GOSKOMSTAT (2002); Practical Science Database/Russia in Figures (2004)</td>
<td>1990-2001, annually</td>
</tr>
<tr>
<td>Ethnic composition of the regional population ((moslem))</td>
<td><strong>Definition</strong>: Proportion of ethnic groups with Moslem, Caucasian or Jewish background <strong>Unit</strong>: Percent of total population in a given region <strong>Comments</strong>: Author’s calculations based on 1989 USSR population census</td>
<td>1989 USSR population census (Lagutenko 2001)</td>
<td>Time-invariant variable: annual data not available</td>
</tr>
</tbody>
</table>

Figure 5-1 Mean urban population in 77 areas of the Russian Federation
EXPLANATORY MODELS

Figure 5-2 Mean divorce rates in 77 areas of the Russian Federation

Table 5-2 (B) Definition of independent and auxiliary variables, social conditions

<table>
<thead>
<tr>
<th>Variable (name)</th>
<th>Definition, Units, Transformation (if performed) Comments</th>
<th>Data Sources</th>
<th>Time coverage, periodicity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crime (crime)</td>
<td>Definition: Registered crime rate Unit: Rates per 100 000 inhabitants, by regions Comments: Figure 5-3 demonstrates time trends for mean crime rates in the regions analysed</td>
<td>GOSKOMSTAT (2002); Practical Science Database/Russia in Figures (2004)</td>
<td>1990-2001, annually</td>
</tr>
<tr>
<td>Education (unir)</td>
<td>Definition: Rate of graduate specialists with a university (or equivalent) degree Unit: Rates per 10 000 inhabitants, by regions Comments: Data on absolute numbers of graduate specialists at the beginning of academic year have been derived from GOSKOMSTAT sources. Rates have been computed with midyear regional populations (myp). At the aggregate level, unir might reflect resources for educational skills improvement (access to information, internet, wide using of modern technique, funding sources etc). Time trends are illustrated by Figure 5-4.</td>
<td>GOSKOMSTAT (2002); Practical Science Database/Russia in Figures (2004) FAIRS</td>
<td>1990-2001, annually</td>
</tr>
<tr>
<td>Abortions (ab)</td>
<td>Definition: Abortions rate Unit: Rates per 1000 women of reproductive age (15-49 years), by regions Comments: Missing values for 1990-1992 are replaced by the regional mean abortion rates for 1993-2001. Figure 5-5 shows mean abortion rates in the regions analysed.</td>
<td>GOSKOMSTAT (2002); Practical Science Database/Russia in Figures (2004)</td>
<td>1993-2001, annually</td>
</tr>
</tbody>
</table>
EXPLANATORY MODELS

Figure 5-3 Mean registered crime rates in 77 areas of the Russian Federation

Figure 5-4 Mean rates of graduate specialists with a university (or equivalent) degree in 77 areas of the Russian Federation

Figure 5-5 Mean abortion rates in 77 areas of the Russian Federation
### Table 5-2 (C) Definition of independent and auxiliary variables, economic indicators

#### C. Economic Indicators

<table>
<thead>
<tr>
<th>Variable (name)</th>
<th>Definition, Units, Transformation (if performed)</th>
<th>Comments</th>
<th>Data Sources</th>
<th>Time coverage, periodicity</th>
</tr>
</thead>
</table>
| Index of trade and services per capita \((\text{itra}ser\text{vC})\) | **Definition**: Volume of retail trade turnover and paid services provided to the population, per capita.  
**Unit**: Thousands of 1991 roubles per capita (inflation adjusted), by regions  
**Transformation**: Natural logarithm  
**Comments**: The variable has been constructed on the basis of GOSKOMSTAT data for the retail trade turnover and the total volume of paid services provided to the population. For further details, see methodological comments and Figure 5-6. | | GOSKOMSTAT (2002); Practical Science Database/Russia in Figures (2004) FAIRS | 1990-2001, annually |
| Agricultural production per capita \((\text{lagrC})\) | **Definition**: Total volume of stockbreeding and plant production, per capita  
**Unit**: Thousands of 1991 roubles per capita (inflation adjusted), by regions  
**Transformation**: Natural logarithm  
**Comments**: Missing values for 1990 have been replaced by the corresponding regional values of 1991. For further details, see methodological comments and Figure 5-7. | | GOSKOMSTAT (2002); Practical Science Database/Russia in Figures (2004) FAIRS | 1991-2001, annually |
| Volume of industrial production per capita \((\text{loppC})\) | **Definition**: Overall industrial production per capita  
**Unit**: Thousands of 1991 roubles per capita (inflation adjusted), by regions  
**Transformation**: Natural logarithm  
**Comments**: Inflation adjustment was performed with the volume index of industrial production \((\text{ipp})\). For further details, see methodological comments and Figure 5-8. | | GOSKOMSTAT (2002); Practical Science Database/Russia in Figures (2004) FAIRS | 1990-2001, annually |
| Volume index of industrial production \((\text{ipp})\) | **Definition**: Changes in the annual volume of industrial production  
**Unit**: Percent from the previous year, by regions  
**Comments**: \(\text{ipp}\) is an auxiliary variable providing the denominator to adjust volume of industrial production for inflation. | | GOSKOMSTAT (2002); Practical Science Database/Russia in Figures (2004) | 1990-2001, annually |
| Consumer Price Index \((\text{incpi})\) | **Definition**: Consumer Price Index (CPI)  
**Unit**: CPI 1991 =1 (by regions)  
**Transformation**: natural logarithm  
**Comments**: CPI provides information as to how much the price of a basket of consumer goods has changed over a given time period. For further details, see methodological comments and Figure 5-9. | | GOSKOMSTAT (2002); Practical Science Database/Russia in Figures (2004) | 1991-2001, annually |
Methodological comments to economic indicators, Table 5-2 (C)

→ Index of trade and services per capita ($ltraservC$)

This variable is considered to represent a proxy measure for the economic restructuring in the Russian regions, indicating the development of consumer-oriented branches (trade and services). Its basic components are defined by GOSKOMSTAT (2002) as follows:

- The retail trade turnover is measured as sales of goods and products – including food and alcoholic beverages – supplied to the population for cash within the reference period (calendar year). The data are collected using the monthly full-scope statistical surveys of large- and medium-sized enterprises, as well as quarterly sampling surveys (non full-scope) of small enterprises and food and goods markets. Estimation of retail trade turnover takes into account informal/shadow business activities.

- Paid services provided to the population by all types of enterprises include transportation and communication, services on accommodation (including hotels) and public utilities, culture, education, tourism, sport, medical and legal services etc. The total volume of paid services is calculated as a total sum of payments received from consumers or their employers, if the latter bear the expenses. This index is based on federal statistical surveys data, as well as on estimations of informal/shadow service activities.

The computation of $ltraservC$ has been accomplished in four steps:

- First, a combined proxy-index of the economic restructuring has been calculated as a sum of values on retail trade turnover and volume of paid services for each region (in nominal prices).

- Second, inflation adjustment due to Consumer Price Index (CPI) has been performed to produce output in comparable prices (billions of 1991 roubles).

- Third, this output has been estimated in thousands of 1991 roubles per capita. For this purpose, official statistical data on midyear regional populations ($myp$) have been used (data basis FAIRS).

- Finally, inflation-adjusted output per capita has been transformed to natural logarithm.

Figure 5-6 illustrates the development of the mean index of trade and services per capita for 77 regions of Russia in comparable prices.
EXPLANATORY MODELS

→ Agricultural production per capita ($\text{largC}$)

This variable is hypothesised to be related to regional economic structure and performance, which provides the foundation for the development of (complementary) economic activities of the population. We assume that lacking restructuring – and, therefore, lacking opportunities to develop complementary economic activities – will first of all be observed in the economically depressed industrial areas and climatically disadvantaged agricultural regions. Consequently, some typical problems of these regions represent major obstacles for effective business activities.

These problems include, for instance, low purchasing capacity of the population, poor trade infrastructure, roads being out of repair etc. Therefore, the main implication is that the panel data analysis needs to control for factors related to economic structure and performance. The classical indicators widely used in various publications comprise e.g., employment by branches to characterise economic structure and gross regional product to measure economic performance. However, these data were unavailable or incomplete in the GOSKOMSTAT (2002) sources. Instead of classical indicators, we used some proxies, such as volume of agricultural production and volume of industrial production (GOSKOMSTAT 2002; Practical Science Database/Russia in Figures 2004).

The computation of $\text{largC}$ involves three steps:

• “deflation” with Consumer Price Index (CPI),
• estimation of per capita output in thousands of 1991 roubles using midyear regional populations data ($\text{myp}$) and
• transformation to natural logarithm.

For two major cities which do not report agricultural production – Moscow and St. Petersburg – natural logarithm of a fictive value (0.001) has been calculated. Missing values for 1990 have been replaced by the corresponding regional values of 1991. We assume that the figures on agricultural production are comparable for 1990-1991.

Figure 5-7 Mean agricultural production per capita in 77 areas of the Russian Federation

→ Volume of industrial production per capita ($\text{loppC}$)

GOSKOMSTAT (2002) defines volume of industrial production as a total nominal price of the overall industrial production manufactured by all types of enterprises within the reference year. The reported figures are corrected with respect to informal (shadow) activities.
EXPLANATORY MODELS

Like other monetary based variables, loppC has been transformed before being used in the panel data analyses.

- First, data were adjusted for inflation with the volume index of industrial production (ipp), provided by GOSKOMSTAT (2002). This index enables the calculation of industrial production volume in comparable prices of 1990, based on a comparable goods assortment structure.
- Second, per capita output has been estimated in thousands of 1990 roubles with the data on mid-year regional populations (myp).
- Computation of natural logarithm accomplished the transformation of this variable.

Figure 5-8 Mean volume of industrial production per capita in 77 areas of the Russian Federation

→ Consumer Price Index (lncri)

Consumer Price Index (CPI) is a well-established measure of inflation, produced by the national statistics. CPI provides information as to how much the price of a basket of consumer goods has changed over a given time period.

Therefore, it measures price changes from the consumer’s perspective. Russian consumer price index is based upon observations on prices of about 380 goods and services in about 350 towns and cities. The goods and services are divided into three broad groups: (1) food and beverages, (2) non-food goods and (3) services (Tsyplakov 2004).

This variable (lncri) is considered to reflect hyperinflation – i.e. inflation “out of control”, a condition in which prices increase rapidly as a currency loses its value. No precise definition of hyperinflation is universally accepted. One simple definition requires a monthly inflation rate of 50% or more. The definition used by most economists is “an inflationary cycle without any tendency toward equilibrium”. An unpredictable inflation development is always a traumatic experience for the countries affected. Hyperinflation increases the risk of economic losses in various business activities. It wipes out the purchasing power of savings held as paper assets, distorts the economy in favour of extreme consumption and hoarding of real assets, causes “hard currency” to flee the country and makes afflicted areas anathema to investments.

The variable (lncri) has been computed in two steps:

- First, official regional data on Consumer Price Index for 1992-2001 (GOSKOMSTAT 2002; Practical Science Database/Russia in Figures 2004) were transformed to the basis of 1991 (CPI=1), as shown at Figure 5-9.
- Second, for the purposes of modelling, natural logarithm of CPI has been calculated.
Table 5-2 (D) Definition of independent and auxiliary variables, labour market situation

<table>
<thead>
<tr>
<th>Variable (name)</th>
<th>Definition, Units, Transformation (if performed) Comments</th>
<th>Data Sources</th>
<th>Time coverage, periodicity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numbers of unemployed persons (<em>un</em>)</td>
<td>Definition: Numbers of unemployed persons (ILO methodology) Unit: Numbers of persons, by regions Comments: <em>un</em> is an auxiliary variable providing the numerator for the calculation of unemployment rates (<em>ur</em>). For further details, see methodological comments.</td>
<td>GOSKOMSTAT (2002); Practical Science Database/ Russia in Figures (2004)</td>
<td>1992-2001, annually</td>
</tr>
<tr>
<td>Economically active population (<em>an</em>)</td>
<td>Definition: Economically active population (labour force) Unit: Numbers of persons, by regions Comments: <em>an</em> is an auxiliary variable providing the denominator for the calculation of unemployment rates (<em>ur</em>). For further details, see methodological comments.</td>
<td>GOSKOMSTAT (2002); Practical Science Database/ Russia in Figures (2004)</td>
<td>1992-2001, annually</td>
</tr>
<tr>
<td>Unemployment rates (<em>ur</em>)</td>
<td>Definition: Unemployment rates (ILO methodology) Unit: Percent of the total labour force, by regions Comments: The variable has been computed on the basis of GOSKOMSTAT data on (1) numbers of unemployed persons (<em>un</em>) and (2) economically active population (<em>an</em>). For further details, see methodological comments and Figure 5-10.</td>
<td>See data sources for the variables <em>un</em> and <em>an</em></td>
<td>1992-2001, annually</td>
</tr>
<tr>
<td>Numbers of unemployed per one vacancy (<em>uppp</em>)</td>
<td>Definition: Numbers of registered unemployed persons per one registered vacant position Unit: Numbers of persons, by regions Comments: Proxy for chances to get employed. For further details, see methodological comments and Figure 5-10.</td>
<td>GOSKOMSTAT (2002); Practical Science Database/ Russia in Figures (2004)</td>
<td>1992-2001, annually</td>
</tr>
</tbody>
</table>
Methodological comments to labour market situation, Table 5-2 (D)

→ **Numbers of unemployed persons (un)**

The general (ILO) unemployment figures are obtained through labour force surveys carried out with ILO methodology. Exactly, unemployed persons in Russia (ILO definition) comprise those aged 15-72 years who were: (a) without work during the reference week, in paid employment or self-employment; (b) actively seeking work, i.e. had taken specific steps – having been in contact with a public or commercial employment office to find a work; placing or answering job advertisements; applying to employers directly; asking among friends, relatives, unions etc to find work; looking for land, premises or equipment etc in order to get self-employed etc; (c) currently available for work.

→ **Economically active population (an)**

Economically active population (or labour force) includes both the unemployed and those with jobs in the age groups between 15-72 years. People not counted in labour force surveys include students, retired people, and institutionalized people, as well as discouraged workers who simply do not want work.

→ **Unemployment rates (ur)**

Unemployment rates (ur) have been calculated by dividing the numbers of ILO-unemployed persons (un) by the economically active population (an) for each of the Russian administrative areas:

\[
ur = \frac{un}{an} \times 100\%
\]

Data on the numerator and denominator have been taken from official statistical sources (GOSKOMSTAT 2002; Practical Science Database/Russia in Figures 2004). Formally, there was no unemployment in Russia prior to 1992. Therefore, for the purposes of analysis, values for 1990 and 1991 are set to zero.

→ **Numbers of unemployed per one vacancy (uppp)**

The variable (uppp) is specified by the numbers of registered unemployed persons per one registered vacancy (GOSKOMSTAT 2002). It serves as a proxy for “chances to get employed”. The data are provided by the State Employment Services.

The fundamental differences between two measures of unemployment used in this paper – i.e. unemployment rates and “chances to get employed” – have been discussed in detail in Chapter 3 (subsection 3.6.6). For the purposes of analysis, values for 1990 and 1991 are set to zero.
### E. Living Conditions and Welfare

<table>
<thead>
<tr>
<th>Variable (name)</th>
<th>Definition, Units, Transformation (if performed) Comments</th>
<th>Data Sources</th>
<th>Time coverage, periodicity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean private savings per capita (lsav)</td>
<td>Definition: Per capita balances on SBERBANK deposits at the end of the fiscal year &lt;br&gt; Unit: Thousands of 1991 roubles per capita (inflation adjusted), by regions &lt;br&gt; Transformation: Natural logarithm &lt;br&gt; Comments: The variable approximates financial losses of the population. For further details, see methodological comments and Figure 5-11.</td>
<td>GOSKOMSTAT (2002); Practical Science Database/Russia in Figures (2004)</td>
<td>1990-2001, annually</td>
</tr>
<tr>
<td>Mean amounts of SBERBANK deposits (msav)</td>
<td>Definition: Mean annual amounts of private SBERBANK deposits &lt;br&gt; Unit: Roubles, by regions &lt;br&gt; Comments: msav is an auxiliary variable providing the denominator for the calculation of the number of private deposit accounts per capita (account). For further details, see methodological comments.</td>
<td>GOSKOMSTAT (2002); Practical Science Database/Russia in Figures (2004)</td>
<td>1990-2001, annually</td>
</tr>
<tr>
<td>Number of private deposit accounts per capita (account)</td>
<td>Definition: Number of private deposit accounts (SBERBANK) per capita &lt;br&gt; Unit: Numbers per capita, by regions &lt;br&gt; Comments: account approximates the development of (complementary) economic activities of the population. For further details, see methodological comments and Figure 5-12.</td>
<td>See data sources for the variables lsav and msav.</td>
<td>1990-2001, annually</td>
</tr>
<tr>
<td>Dichotomised number of private deposit accounts per capita (accountd)</td>
<td>Definition: Dummy variable (dichotomised number of private deposit accounts per capita) &lt;br&gt; Unit: 0=&quot;low number of accounts&quot; 1=&quot;high number of accounts&quot; &lt;br&gt; Comments: This dummy variable is constructed on the basis of account. It is used to proxy the level of (complementary) economic activities of the population. For further details, see methodological comments.</td>
<td>See data sources for the variables lsav and msav.</td>
<td>Time-invariant variable</td>
</tr>
<tr>
<td>Interactive term (accsav)</td>
<td>Definition: Interactive term: ( accsav = lsav \times accountd ) &lt;br&gt; Comments: accsav has been introduced to test whether the impact of per capita savings (lsav) on mortality is different in the regions with high versus low level of economic activities (by accountd). For further details, see methodological comments.</td>
<td>See data sources for the variables lsav and msav.</td>
<td>1990-2001, annually</td>
</tr>
<tr>
<td>Mean annual income per capita (linc)</td>
<td>Definition: Mean annual per capita income from legal activities – e.g., wages and salaries, earnings from legal business, pensions and social benefits etc. &lt;br&gt; Unit: Thousands of 1991 roubles per capita (inflation adjusted), by regions &lt;br&gt; Transformation: Natural logarithm &lt;br&gt; Comments: For further details, see methodological comments and Figure 5-13.</td>
<td>GOSKOMSTAT (2002); Practical Science Database/Russia in Figures (2004)</td>
<td>1990-2001, annually</td>
</tr>
</tbody>
</table>
Methodological comments to living conditions and welfare, Table 5-2 (E)

→ Mean private savings per capita (lsav)

Mean private savings per capita – defined as per capita balances on SBERBANK deposits at the end of the fiscal year – have been used to approximate financial losses of the population. Since the Soviet time, SBERBANK – or the Savings Bank of the Russian Federation – has the widest network of branches throughout the whole country. In some remote areas of Russia, SBERBANK is the only available institution providing bank services for the population. SBERBANK is considered to be the most reliable bank in the country – its major shareholder is the Central Bank of the Russian Federation disposing more than 60% of SBERBANK’s statutory capital shares (SBERBANK 2004). Therefore, for many Russians, SBERBANK is “the bank of choice”.

The computation of lsav has been performed in two steps:

- “deflation” with Consumer Price Index (CPI) and
- transformation to natural logarithm.

The original non-transformed variable (sav) represents a quotient of total volume of deposits (roubles) and the total population (population) in a given administrative area:

\[ \text{sav (non – transformed)} = \frac{\text{roubles}}{\text{population}} \]

This variable has been used as a numerator for the calculation of the number of private deposit accounts per capita (account).

Figure 5-11 Mean private savings per capita in 77 areas of the Russian Federation

→ Mean amounts of SBERBANK deposits (msav)

In the original data source (SBERBANK), mean annual amounts of private deposits (msav) for a given administrative area are calculated as total annual volume of deposits (roubles) divided by the total number of deposit accounts (accounts). In other words, this variable (msav) gives information as to how many roubles – annually – are there on an average private deposit account in each of the regional areas:
This variable has been used as a denominator to calculate the number of private deposit accounts per capita (account).

→ **Number of private deposit accounts per capita (account)**

The variable (account) has been used as a proxy for the development of (complementary) economic activities of the population. This assumption is based on some peculiarities of Russian banking system, in which private SBERBANK accounts have the form of purpose-oriented deposits – wage or pension deposits etc. Therefore, economically active persons with multiple working places or odd jobs – both in the shadow and legal economy – are more likely to hold multiple deposit accounts. Intrinsically, economic activity may represent an economical “survival strategy” of the Russian population.

Unfortunately, the regional numbers of SBERBANK deposit accounts per capita were not explicitly given in the available data sources. However, it was possible to “reconstruct” this information using two types of statistical data published by GOSKOMSTAT (2002) and Practical Science Database/Russia in Figures (2004): namely, mean private savings per capita and mean amounts of SBERBANK deposits.

Dividing the non-transformed variable sav by mean amount of deposits (msav) for a given administrative area we obtain regional numbers of deposit accounts per capita (account), as illustrated by the following equation:

\[
\frac{\text{sav}}{\text{msav}} = \frac{\text{roubles}}{\text{population}} \div \frac{\text{roubles}}{\text{accounts}} = \frac{\text{roubles} \times \text{accounts}}{\text{population} \times \text{roubles}} = \frac{\text{accounts}}{\text{population}} = \text{account}
\]

Figure 5-12 Mean number of private deposit accounts per capita in 77 areas of the Russian Federation

→ **Dichotomised number of private deposit accounts per capita (accountd)**

This dummy variable has been computed by means of a cluster analysis (k-means method) carried out for the variable account (regional mean values for 1990-2001) Two big clusters have been identified:

Cluster 1 → N=39 regions with a low number of private deposit accounts (circa 1.2 per capita),
Cluster 2 → N=38 regions with a high number of private deposit accounts (circa 1.6 per capita).

Correspondingly, accountd takes on the values 0 or 1:
**accountd** = 0 if the mean regional number of private deposit accounts is low (Cluster 1),
**accountd** = 1 if the mean regional number of private deposit accounts is high (Cluster 2).

We suppose **accountd** to approximate the level of (complementary) economic activities of the population, including those related to small-scale shadow or "grey" business. The basic assumption was that an output of small-scale complementary activities could – at least to some extent – be reflected by the Savings Bank statistics on private deposit accounts. This variable has been used as a multiplier to construct the interactive term accsav.

→ Interactive term (accsav)

An attempt has been made to identify a proxy-variable characterising the risks related to (complementary) economic activities of the population. During the time period analysed, a considerable share of all business transactions has been developed in the shadow economy. Therefore, no legal security regulations, as well as no legal protection of labour and earnings have been available for the people involved in these activities.

This can be illustrated by the example of one of the most widespread professions of the 1990s, which dealt with unregistered imports in Russia (Friedman & Verbetsky 2001). Many people earned their living physically importing cheap goods from abroad, without any firms or companies (so-called “shuttle-traders” or “chelnoki”). “Shuttle-traders” were said to provide clothing for a half of the nation. This small-scale shadow business was associated with many risks and challenges, such as racket, excessive taxes, counterfeit US-dollar bills etc. The term “racket” could range from organised crime to local economic associations or other organisations not associated with the local police or judicial system. Despite the risks, people got involved in the shadow entrepreneurship, as there were no other reliable sources of income for them in the circumstances of the protracted economic crisis. Their earnings were, however, insufficient to buy enough security. Probably, small-scale economic activities – both shadow and legal – do not immediately result in increased wealth, which can be measured e.g., as per capita savings. On the opposite, economic risks and related expenses emerge at the very beginning of any entrepreneurship – they are immanent in unstable and insecure economic environment within the time span analysed.

Let us imagine the following scenario. There are two hypothetical regions with the same level of material wealth, assessable as per capita savings. However, in one of these regions, the population needs to be “more active” to sustain this level. Perhaps, this region will exhibit higher mortality – as compared to its counterpart with more “relaxed” population’s attitudes to economic activities.

The interactive term (accsav) is computed as a product of mean regional per capita savings (lsav) and the dichotomised level of economic activity of the population (accountd):

\[ accsav = lsav \times accountd \]

It helps us to test whether the impact of per capita savings on mortality is different in the regions with high versus low level of economic activities. This approach enables us to control for risks related to economic activities of the population.

Inherently, savings and economic activities may have a “protective” effect on mortality. If, however, the effect of savings will be adjusted for the risks described above, its protective role may be diminished.

→ Mean annual income per capita (linc)

The variable (linc) is assumed to approximate risks related to non-shadow economic activities of the population. We assume that a higher mean income level will be observed in the regions with a rapid development of economic restructuring, involving a strenuous fight for the influence spheres in the new “self-regulating” markets, typical for the "wild capitalism". This process may be associated with considerable economic risks for the beginner-businessmen, as well as with an increased social tension due to wealth polarisation.

National statistical authority of the Russian Federation publishes regional data on mean per capita monthly income in nominal roubles. Therefore, the variable linc has been computes as follows:
• First, monthly income has been converted to mean annual income.
• Second, “deflation” with Consumer Price Index (CPI) has been performed.
• Finally, natural logarithm has been calculated.

Figure 5-13 Mean annual per capita income for 77 areas of the Russian Federation

Table 5-2 (F) Definition of independent and auxiliary variables, climatic conditions

<table>
<thead>
<tr>
<th>Variable (name)</th>
<th>Definition, Units, Transformation (if performed)</th>
<th>Data Sources</th>
<th>Time coverage, periodicity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Climate dummy (rc_dum)</td>
<td>Definition: Dummy variable for hardship of climatic conditions Unit: 0=&quot;good climate&quot; (comfortable and sub-comfortable climatic conditions); 1=&quot;bad climate&quot; (discomfortable, hard and extremely severe climatic conditions); by regions</td>
<td>Prokhorov (1996); Prokhorov (1998); Web Atlas Environment and Health of the Russian population (2004)</td>
<td>Time-invariant variable</td>
</tr>
</tbody>
</table>
| Interactive term (rccpi) | Definition: Interactive term:
\[ rccpi = rc \_ dum \times ln \_ cpi \]
Comments: The interactive term (rccpi) helps to test, whether the effects of inflation on mortality differ for climatically advantaged versus disadvantaged regions. It is assumed to indicate higher costs of living and production in climatically disadvantaged areas, accelerated by inflation. | See data sources for the variables rc_dum and lnpci. | 1990-2001, annually |
Methodological comments to climatic conditions, Table 5-2 (F)

Climate dummy \((rc\_dum)\)

The Web Atlas Environment and Health of the Russian population (2004) rates regional climatic conditions as (1) comfortable, (2) sub-comfortable, (3) discomfortable, (4) hard and (5) extremely severe.

This rating represents an integral valuation of more than 30 climate parameters — e.g., continentality, duration of low- or high-temperature seasons, air temperatures amplitudes (yearly, monthly and daily), water resources, quality and accessibility of water, threat of natural disasters (seismicity, floods, avalanches etc), endemic factors, leading pathological conditions in different population groups etc (Prokhorov 1996 p72; Prokhorov 1998 p312).

Table 5-2 (G) Definition of independent and auxiliary variables, miscellaneous

<table>
<thead>
<tr>
<th>Variable (name)</th>
<th>Definition, Units, Transformation (if performed) Comments</th>
<th>Data Sources</th>
<th>Time coverage, periodicity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trend ((yed))</td>
<td>Definition: Trend Unit: Codes from 0 to 11 have been assigned to each year of observation: (1990=0; 1991=1; 1992=2\ldots 2001=11) space-invariant index variable Comments: Control for unobservable time effects</td>
<td>Author's computation</td>
<td>1990-2001, annually</td>
</tr>
<tr>
<td>Squared trend (\text{ye}^2)</td>
<td>Definition: Squared trend Unit: Squared values of (yed): [ y\text{e}^2 = ye^2 ] space-invariant index variable Comments: Control for unobservable time effects</td>
<td>Author's computation</td>
<td>1990-2001, annually</td>
</tr>
<tr>
<td>Accidental poisoning by alcohol ((alcp))</td>
<td>Definition: Accidental poisoning by alcohol, ICD-10 codes: X45.0-X45.9 Unit: SDR per 100 000 inhabitants (European standard) Comments: Proxy for heavy binge drinking Figure 5-14 shows mean SDR per 100 000 inhabitants in the regions analysed.</td>
<td>FAIRS</td>
<td>1990-2001, annually</td>
</tr>
<tr>
<td>Regional atypism dummy ((atyp))</td>
<td>Definition: Regional atypism dummy Unit: 0=&quot;typical regions&quot; 1=&quot;atypical region&quot; (Republic of Tuva) Comments: Approximates special effects of the atypical region Tuva Tuva is an outlier with respect to homicide mortality and one of the poorest Russian regions.</td>
<td>Author's computation</td>
<td>Time-invariant variable</td>
</tr>
<tr>
<td>Interactive term ((lincatyp))</td>
<td>Definition: Interactive term: [ lincatyp = linc \times atyp ] Comments: The interactive term ((lincatyp)) helps to test, whether the effects of aggregate-level income on mortality ((linc)) differ for Tuva and the rest of the regions.</td>
<td>See data sources for the variables (linc) and (atyp)</td>
<td>1990-2001, annually</td>
</tr>
</tbody>
</table>
Following the general description and definition of the independent and auxiliary variables, we intend to address the issue of their hypothesised roles. Yet, these roles may differ even for the same explanatory variable, depending on the outcomes of interest.

For instance, mean private per capita savings ($lsav$), indicating the presence of financial losses of the population, may play the role of a core transition-related stressor with respect to suicide and homicide mortality.

For the marginalised never-do-well alcoholics, who are especially at risk of fatal alcohol poisonings, the stressogeneity of financial losses may be of little importance. Those who are down-and-out for a long time, have nothing to lose – at least in the sense of material well-being. Therefore, the interpretation of aggregate-level savings with respect to marginalisation-related causes of death should be more prudent – they should be treated as a sign of rapid unfavourable changes in Russian regional economic environment, reinforcing the marginalisation process.

The sets of explanatory variables will be systematised below in accordance with their roles assumed – separately for stress-related and marginalisation-related mortality responses. Again, we prefer a tabulated presentation, in which the main conceptual ideas of Chapter 3 and Chapter 4 can be brought together with the essentials of this subsection in a compact and illustrative outline (see Table 5-3, A-B).
### Table 5-3 (A) Sets of explanatory variables proposed for the models of stress-related mortality (suicide and homicide)

<table>
<thead>
<tr>
<th>Explanatory variables (name)</th>
<th>Role hypothesised</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SET 1: CORE TRANSITION-RELATED STRESSORS</strong></td>
<td></td>
</tr>
<tr>
<td>Group 1: Financial losses of the population</td>
<td></td>
</tr>
<tr>
<td>Mean private savings per capita (l salvar)</td>
<td>financial losses of the population</td>
</tr>
<tr>
<td><strong>Group 2: Side-effects of incomplete economic restructuring in unstable and insecure economic environment</strong></td>
<td></td>
</tr>
<tr>
<td>Volume of industrial production per capita (lopp C)</td>
<td>factors related to regional economic structure and performance: background for economic passivity of the regional populations</td>
</tr>
<tr>
<td>Agricultural production per capita (lagr C)</td>
<td>factors related to regional economic structure and performance: background for economic passivity of the regional populations</td>
</tr>
<tr>
<td>Index of trade and services per capita (l traserv C)</td>
<td>economic restructuring</td>
</tr>
<tr>
<td>Consumer Price Index (lncpi)</td>
<td>risks of economic losses: unpredictable inflation development</td>
</tr>
<tr>
<td>Mean annual income per capita (linc)</td>
<td>risks related to non-shadow economic activities of the population</td>
</tr>
<tr>
<td>Interactive term (acc sav)</td>
<td>risks related to (complementary) economic activities of the population</td>
</tr>
<tr>
<td><strong>Group 3: Elevated magnitude of transition-related problems in climatically disadvantaged areas</strong></td>
<td></td>
</tr>
<tr>
<td>Climate dummy (rc dum)</td>
<td>hardship of climatic conditions</td>
</tr>
<tr>
<td>Interactive term (rc cpi)</td>
<td>higher costs of living and production in climatically disadvantaged areas, accelerated by inflation</td>
</tr>
<tr>
<td><strong>SET 2: “SURVIVAL STRATEGIES” OF THE POPULATION DURING THE PROTRACTED ECONOMIC CRISIS</strong></td>
<td></td>
</tr>
<tr>
<td>Number of private deposit accounts per capita (account)</td>
<td>development of (complementary) economic activities of the population</td>
</tr>
<tr>
<td>Dichotomised number of private deposit accounts per capita (accountd)</td>
<td>level of (complementary) economic activities of the population</td>
</tr>
<tr>
<td><strong>SET 3: “CLASSICAL DETERMINANTS” OF MORTALITY (STRESS MODERATORS)</strong></td>
<td></td>
</tr>
<tr>
<td>Accidental poisoning by alcohol (aclp)</td>
<td>heavy binge drinking</td>
</tr>
<tr>
<td>Crime (crime)</td>
<td>social tension / disruption</td>
</tr>
<tr>
<td>Education (unir)</td>
<td>resources for educational skills improvement</td>
</tr>
<tr>
<td>Ethnic composition of the regional population (moslem)</td>
<td>social cohesion/support</td>
</tr>
<tr>
<td>Unemployment rates (ur)</td>
<td>regional unemployment rates (ILO methodology): loss of material resources; downward mobility in socioeconomic status; increase in behavioural risk factors etc</td>
</tr>
<tr>
<td>Numbers of unemployed per one vacancy (uppp)</td>
<td>“chances to get employed”: loss of material resources; downward mobility in socioeconomic status; increase in behavioural risk factors etc</td>
</tr>
<tr>
<td><strong>SET 4: AUXILIARY VARIABLES</strong></td>
<td></td>
</tr>
<tr>
<td>Trend (yed)</td>
<td>control for unobservable time effects</td>
</tr>
<tr>
<td>Squared trend (ye2)</td>
<td>control for unobservable time effects</td>
</tr>
<tr>
<td>Regional atypism dummy (atyp)</td>
<td>special effects of the atypical region Tuva</td>
</tr>
<tr>
<td>Interactive term (linc atyp)</td>
<td>absence of “wild capitalism risks” in the atypical region Tuva</td>
</tr>
</tbody>
</table>
### Table 5-3 (B) Sets of explanatory variables proposed for the models of marginalisation-related mortality (accidental poisoning by alcohol)

<table>
<thead>
<tr>
<th>Explanatory variables (name)</th>
<th>Role hypothesised</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SET 1: UNFAVOURABLE SOCIOECONOMIC ENVIRONMENT</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Group 1: Rapid unfavourable changes in economic environment</strong></td>
<td></td>
</tr>
</tbody>
</table>
| Mean private savings per capita (*lsav*) | Financial losses of the population:  
  ➔ rising poverty  
  ➔ marginalisation  
  ➔ increased societal tolerance of heavy binge drinking  
  (acceptance of “drowning sorrows and misery” in alcohol) | |
| Index of trade and services per capita (*ltraservC*) | Economic restructuring:  
  ➔ increasing income inequality  
  ➔ marginalisation  
  ➔ increased societal tolerance of heavy binge drinking  
  (acceptance of “drowning sorrows and misery” in alcohol) | |
| **Group 2: Anomie, alienation, social isolation** |                                                                      |
| Crime (*crime*) | Social tension / disruption ➔ magnitude of anomie, alienation, social isolation | |
| Divorces (*div*) | Anomie, alienation, social isolation | |
| Abortions (*ab*) | Anomie, alienation, social isolation | |
| Unemployment rates (*ur*) | Regional unemployment rates (ILO methodology):  
  ➔ loss of material resources; downward mobility in socioeconomic status; increase in  
  behavioural risk factors;  
  ➔ alienation, social isolation | |
| **SET 2: DRINKING HABITS** |                                                                      |
| Education (*unir*) | Drinking habits by educational background | |
| Ethnic composition of the regional population (*moslem*) | Drinking habits by ethnic groups | |
| Urbanisation (*urb*) | Drinking habits by urban / rural settings | |
5.3 Statistical methods

5.3.1 Panel data models – the reasons for the choice

Our data have a typical panel (longitudinal) structure – i.e. they represent a cross-section of region-specific data pooled over time. Sometimes we use the term “sampling” to emphasize the fact that the set of administrative areas considered in this paper do not correspond to the totality of all large geographic units of Russia. This set may not be representative for the whole country, since the areas omitted might differ from this “sample” in a variety of ways – e.g., living and climatic conditions or mortality.

Given the data nature, a pooled cross-sectional time series analysis – otherwise termed as panel data analysis – represents the most advantageous econometric technique. This approach is completely justified when many cross-sectional observations \( N \) – of, say, individuals, households, firms or administrative areas – cover a relatively short time period \( T \), so that \( N > T \). In our case, there are 77 administrative areas of the Russian Federation \((N=77)\) and 12 years of observation \((T=12)\). Therefore, our pool has a “cross-sectional dominant” (Stimson 1985). Given this preamble, we can write the generic equation for a pooled regression model with panel data as follows:

\[
y_{it} = \alpha + \sum_{k=1}^{K} \beta_k x_{kt} + \lambda_{it}
\]

where \( i=1,2,\ldots;N; \) refers to a cross-section unit (region); \( t=1,2,\ldots;T; \) refers to a time period (year) and \( k=1,2,\ldots;K; \) refers to a specific explanatory variable. Correspondingly, \( y_{it} \) and \( x_{it} \) denote dependent and independent variables for unit \( i \) and time \( t \); \( \lambda_{it} \) represents an error term; \( \alpha \) and \( \beta_k \) indicate, respectively, the intercept and the slope parameters.

A panel data analysis enables to answer questions which are not possible to be addressed either from a classical cross-section perspective or with a pure time series. A classical cross-sectional approach has only one historical context: it resembles a “snapshot” of a phenomenon – describing e.g., a bunch of symptoms in a group of sick individuals in relation to a diagnostic entity. However, it is unable to follow up the sequence of events in the development of a pathologic process, such as acquisition or intensification of symptoms. Single time series allows for multiple historical context, but for only one spatial location. Continuing to draw the medical parallel, we may compare the time-series approach with a description of the natural history of disease – but only in one individual. A panel data analysis represents an opportunity to examine the whole variety of “symptoms”, as well as the dynamics of a “pathologic process” – within a definite time span – for many cross-sectional units.

Therefore, the panel data analysis has some significant advantages.

First, panel data models allow us to look at dynamic relationships between the variables – unlike a single classical cross-section. Simultaneously, we can consider spatial aspects of our data; that would be impossible using pure time series analysis. Therefore, a panel data approach combines simultaneously both the space and time domains of the units of observation studied. This is because, instead of testing a cross-sectional model for all regions at one particular time point – or testing a time series model for one region across time – a pooled panel data model is tested for all regions through time (Pennings et al 1999 p172).

Second, panel data models enable to inquiry into variables that “elude” in a simple cross-sectional or time-series analysis. This is because their variability is negligible or not existent across either time or space. In our data set, we use space-invariant trends \((yed, ye2)\), while some of the regional characteristics are considered to be time-invariant – for instance, climate \((rc_dum)\) or
EXPLANATORY MODELS

The ethnic composition of regional populations (moslem). Thus, regression models with panel data – combining time and space dimensions – may rely upon higher variability of data in comparison to a pure time series or a cross-sectional design (Hicks 1994 p170-171).

Third, panel data models also allow us to control for unobserved cross-section heterogeneity – this feature is not given in a pure time series analysis. In a cross-sectional model, these effects may become “absorbed” by the error term. This issue is often described as “omitted variables problem” (Wooldridge 2002, p50). If parameters estimation is based upon ordinary least squares method (OLS), we might have statistical difficulties, when these unobservable effects are correlated with explanatory variables. In such cases, regressors correlated with the error term are said to be endogenous. Under these conditions, OLS parameter estimates will not be consistent. Given the nature of our data, we expect considerable cross-section region-specific heterogeneity to exist within our models. These expectations are based on regional mortality patterns examined in Chapter 2. At the same time, regions are likely to systematically vary in terms of population living standards, economic structure and performance etc. Consequently, the use of standard cross-sectional models with the ordinary least squares method would probably lead to biased estimates. Moreover, the direction of this bias can not be identified a priori. Therefore, panel data models providing robust estimates in the presence of unobserved cross-section heterogeneity represent the matter of choice.

Finally, from a statistical point of view, the sample size can be multiplied in a panel data analysis, producing a set of \( N \times T \) observations. This allows us to test the impact of a large number of predictors within the framework of a multivariate analysis (Schmidt 1997). Therefore, a more extensive range of hypotheses can be tested with panel data.

Given the advantages of the panel data analysis, it has become very popular in the theoretical and applied public health literature – especially in the last two decades. For instance, this technique has been utilised to assess some socioeconomic determinants of demographic processes. Karras & Chiswick (1999) studied an impact of macroeconomic factors – e.g., cyclical economic conditions – on net immigration to Germany from European countries during 1964-88. Using pooled cross-sectional approach which included fixed effects model, Galloway and colleagues (1994) examined predictors of fertility decline in 407 Prussian administrative areas (Kreise) from 1875 to 1910. One group of significant predictors was related to the economic structure – measured as proportion of workers in extractive industry (mining). Another group comprised changes in religion and ethnic structure of the population.

Several authors have applied pooled models in the field of health economics and public policy. Gerdtham et al (1998) investigated the determinants of aggregate health expenditures in 22 OECD countries for a 20-year period – in particular, the way of remunerating physicians in the ambulatory care sector and the use of primary care “gatekeepers”. Canadian researchers (Di Matteo & Di Matteo 1998) have utilised pooled time-series cross-section models to examine the impact of population aging and federal transfer payments on the provincial government health expenditures over the period 1965-1991 in their country.

Despite its increasing popularity in the theoretical and applied public health literature, this approach is still quite uncommon in the epidemiologic research. Some relevant papers can however be mentioned.

Her & Rehm (1998) have analysed relationships between alcohol consumption and all-cause mortality in 25 European countries between 1982 and 1990. Having applied the method of pooled cross-section time-series analysis to differenced data, the authors have shown that increases/decreases in the per capita consumption of 1 litre of pure alcohol were associated with increases/decreases of 1.3% in all-cause mortality rates.
Laporte & Ferguson (2003) have focussed on the issue of whether the level and dispersion of income affects mortality in nine of Canada’s ten provinces over the period 1980-1997. Due to lacking significance of the regression coefficients for income level and Gini index, the authors failed to demonstrate a crucial role of these variables in relation to total mortality. Their results suggest, however, that unemployment and health expenditures seem to represent important mortality predictors.

A research paper of Andrienko (2001) is of a particular interest, since it examines socioeconomic, demographic and climate-related determinants of crime – homicide and larceny – in 1990-1998 for 70 Russian regions employing panel data analysis. The author found that property crime is “substituted” by violence when there is higher income inequality, lower real income and lower unemployment. Quality of police service – measured as crime detection rate – has a significantly negative association both with homicide and larceny. Higher alcohol consumption increases violence but decreases property crime. Educational attainment has a protective effect on the both types of crime. And, finally, a clear north-east gradient for homicide rate is supported by the regression results.

Since panel data consist of repeated observations on the same cross-section units over time, the “sample” can not be treated as random and independent. Therefore, some of the standard assumptions of the classical OLS-estimation concerning error term appear much too restrictive in pooled designs. Numerous theoretical papers discussed these methodological issues (Stimson 1985; Hicks 1994; Beck & Katz 1995; 1996). Here is a brief review of the most important issues.

For instance, the first problem is that pooling data can result in serial correlation of errors, as errors tend not to be independent from a period of time to the next. In other terms, errors in region \( i \) at time \( t \) are correlated with errors in region \( i \) at time \( t+1 \). This happens because temporally successive values of some explanatory variables may reflect regional traits which tend to be interdependent across time – for example, population size, proportion of definite population groups etc.

Second, errors might be contemporaneously correlated, so that errors in region \( i \) at time \( t \) is correlated with errors in region \( j \) at time \( t \). This occurs when our dependent variable exhibits some sort of behaviour – common for some groups of regions – which is not completely captured by the set of explanatory variables.

Third, errors tend to be heteroskedastic – i.e. their variance differs between the values of a particular explanatory variable. This problem may take place if the scale of the dependent variable considerably differs between subsets of regions (Beck & Katz 1995).

Fourth, errors tend to conceal unit and period effects. They may include both temporal and cross-sectional components reflecting cross-sectional and temporal effects. Therefore, OLS regression is unlikely to produce unbiased parameter estimation, and the apparent level of heteroskedasticity and autocorrelation will be substantially inflated (Stimson 1985; Podesta 2002; 2003).

Fifth, errors might be non-random across spatial and/or temporal units because parameters are heterogeneous across subsets of units. Since processes linking dependent and explanatory variables tend to vary across subsets of regions, errors tend to reflect some heterogeneity across space, time or both (Hicks 1994 p172).

These error term complications can clearly be attributed to unobserved effects, or omitted variables. Several approaches have been proposed in the last decades to tackle the omitted variables problem.

One of the simplest solutions would be to treat unobserved region-specific effects as a time-constant estimable variable. In other words, it can be assumed that these unit-specific effects have
EXPLANATORY MODELS

no distribution – they are fixed for each particular regional unit. Therefore, we could decompose the error term from equation (1) as follows:

\[ \lambda_{it} = u_i + e_{it} \]

where \( u_i \) denotes fixed unobserved components (region-specific effects), whereas \( e_{it} \) refers to idiosyncratic errors – termed otherwise as idiosyncratic disturbances. Idiosyncratic errors change across \( t \) as well as across \( i \) (Wooldridge 2002 p251). Thus, the basic equation (1) can be rewritten as follows:

\[ y_{it} = \alpha + \sum_{k=2}^{K} \beta_k x_{kit} + u_i + e_{it} \] (2)

Another form of this equation is

\[ y_{it} = (\alpha + u_i) + \sum_{k=2}^{K} \beta_k x_{kit} + e_{it} \] (3)

It implies that we allow for different region-specific intercepts, but constrain the slopes to be the same across regions.

The assumption of fixed region-specific effects represents the foundation for the so-called \textit{fixed effects models}. In econometric applications, the term “fixed effect” does not usually mean that \( u_i \) is being treated as non-random; rather, it means that one is allowing for arbitrary correlation between the unobserved effect \( u_i \) and the observed explanatory variables. Therefore, the assumption of strict exogeneity of regressors is less restrictive in fixed effects models. By relaxing this assumption we can consistently estimate partial effects of our explanatory variables in the presence of time-constant omitted variables (Wooldridge 2002 p266).12

How can we obtain parameter estimation with fixed effects models? The basic idea is to transform the equation in order to eliminate the unobserved effect \( u_i \).

This purpose is accomplished by means of the \textit{fixed effects transformation}, also called the \textit{within transformation}, in which observations for each particular region are differenced around the regional means. This is illustrated by equation (5). The first logical step leading to equation (5) is given by equation (4).

\[ \bar{y}_i = (\alpha + u_i) + \sum_{k=2}^{K} \beta_k \bar{x}_{kit} + \bar{e}_i \] (4)

where \( \bar{y}_i = \sum_{t} y_{it} / T_i \), \( \bar{x}_{kit} = \sum_{t} x_{kit} / T_i \), and \( \bar{e}_i = \sum_{t} e_{it} / T_i \).

Further, if we subtract (4) from (3), it must be true that

\[ (y_{it} - \bar{y}_i) = \sum_{k=2}^{K} \beta_k (x_{kit} - \bar{x}_{kit}) + (e_{it} - \bar{e}_i) \] (5)

---

12 Consistency of estimators implies that their distribution tends to become concentrated on the true value of parameters as sample size increases to infinite (Kmenta 1986 p123).
EXPLANATORY MODELS

These equations provide the basis for consistent estimating $\beta$. Some scholars consider fixed effects models to be a remedy for unobserved effects in the error term (Podesta 2003 p5). However, this remedy comes at a price: as follows from equation (5), there is no way to distinguish the effects of observed time-constant explanatory variables from the time-constant unobservable $u_i$. This means in our case that the coefficients for time-invariant regressors – like climate-dummy or ethnic composition of regional populations – will be dropped.

For this reason, we need to develop a strategy allowing for consistent and efficient\(^{13}\) parameter estimation – including time-invariant regressors. Simultaneously, this strategy should take into account unobserved region-specific effects in the error term. This will be achieved by employing and comparing two types of models – i.e. fixed and random effects models. The latter will be briefly described below.

### 5.3.2 The random effects model

As discussed in the previous subsection, fixed effects models are appropriate if there are no time-invariant explanatory variables. If we are primarily interested in the effect of a time-constant regressor, the robustness of the fixed-effects estimator to correlation between the unobserved effect and the explanatory variables is practically useless.

Another argument for employing of fixed effects models relates to inferences to be drawn from modelling results. Namely, fixed-effects estimates are conditional on the set of regions analysed, in which $u_i$ are assumed to be non-stochastic. Therefore, any generalisation of inferences beyond the set of regions examined may be associated with considerable difficulties. In other words, if our set of regions would be broadly exhaustive for the whole country, fixed effects models would be completely justified (Anatol'ev 2003 p73; Podesta 2002 p32).

However, our set of regions represents a kind of a “sample”, and we would like to make inferences about the whole country – including twelve omitted “atypical” regions. In such cases, random effects models are generally recommended (Anatol'ev 2003 p73; Podesta 2002 p32).

In this type of models, $u_i$ is treated as “region-specific random effect” – a component of the error term. In modern econometric parlance, “random effect” is synonymous with zero correlation between the observed explanatory variables and the unobserved effects. Therefore, there is a strict exogeneity assumption on the explanatory variables (Wooldridge 2002 p257). This appears much too restrictive for a panel data analysis. If the assumption of strict exogeneity is violated, random-effects estimator is not consistent. However, if this assumption holds, random-effects estimator is said to be efficient, as compared to a fixed effects model\(^{14}\).

The random effects model requires a Generalised Least Squares approach (GLS) to deal with the more complex error structure that fixed effects models have. Parameter estimation is based on equation (6):

\[
(y_{it} - \theta \bar{y}_i) = \alpha (1 - \theta) + \sum_{k=2}^{K} \beta_k (x_{kit} - \theta \bar{x}_{ki}) + \{u_i (1 - \theta) + (e_{it} - \theta \bar{e}_i)\}
\]

where $\theta$ is a function of error variances, i.e. of $\sigma^2_u$ and $\sigma^2_e$.

\(^{13}\) An efficient estimator is one that has the smallest dispersion – i.e. its distribution has the smallest variance (Podesta 2002 p9).

\(^{14}\) In a fixed effects model, estimators will have a bigger variance than in a pooled OLS model, since there will be less degrees of freedom than in a pooled OLS model.
We explored both fixed and random effects models to explain cause-specific mortality with Russian panel data. Results of different estimates may substantially vary if the time period analysed \((T)\) is short and the number of regional units \((N)\) is large. In order to check, what type of model is more appropriate for our data, we carried out two tests.

One of them – proposed by Hausman (1978) – compares fixed and random effects estimates. This test explores the possibility of applying the more efficient random effects estimation against fixed effects estimation, using the Hausman chi-squared statistic. Since fixed effects estimator is consistent when unobservable \(u_i\) is correlated with regressors, while random effects estimator is inconsistent, a statistically significant difference is interpreted as evidence against the random effects model (Wooldridge 2002 p288; Verbina & Chowdhury 2002). Failure to reject the null-hypothesis of no systematic difference between the estimates means that:

1. random effects model is fine and
2. random effects estimators are similar to the fixed effect estimators, though they are more efficient.

Despite some limitations, described by Wooldridge (2002 p288) in detail, the Hausman test is widely used to check whether random effects models are acceptable. In brief, these limitations are related to lacking conclusiveness of the null-hypothesis rejection or undefined test results – there are too many reasons for this.

Another test used for the purposes of model specification is the Breusch and Pagan Lagrangian multiplier test. It is applied to test the statistical significance of the regional random effects. The null-hypothesis is that the variance of the region-specific error component is equal to zero, that is, \(Var(u) = 0\). The alternative hypothesis states that \(Var(u) \neq 0\). If the test statistics is significant \((p<0.05)\), the test supports rejection of zero variance for region-specific effects. This implies that some type of random effects model is consistent with the data (Breusch & Pagan 1980).

Our decision as to which parameter estimates should be preferred – i.e., those obtained with fixed or random effects models – was based on the results of the test statistics. When the Hausman test was insignificant and the Breusch and Pagan Lagrangian multiplier test provided significant results, estimates from random effects models are reported.

### 5.4 Results

In the previous section, variable sets and data transformation have been described. We have formulated the general approach to a model specification. This section presents the results of panel data models – separately for suicide, homicide and alcohol poisoning mortality.

We start with the purely technical issues – namely, statistical software used and related commands, as well as the test statistics reported in the models output.

Modelling has been carried out with the software package STATA/SE 8.2 for Windows. The commands `xtreg, re` and `xtreg, fe` have been used to get random and fixed effects estimates, respectively. The overall significance of the fixed effects models is given by the F-test statistics. Given that only the asymptotic properties of the random-effect estimators are known, a Wald chi-square statistic, instead of an F-statistic, is reported in the output for the overall significance of the model. The Breusch-Pagan Langrange multiplier test for regional random effects has been applied by means of `xttest0` command after `xtreg, re`. The test statistic, calculated from the OLS residual of the panel regression has a chi-squared distribution with one degree of freedom.
We test the orthogonality of the region-specific error component $u_i$ with the explanatory variables – a condition that is necessary for avoiding inconsistency that can result from omitted variables in the random effects specification. This opportunity is given in the Hausman test. The test statistic has a chi-squared distribution with the degrees of freedom equal to the number of regressors. To perform this test, we have run the following sequence of commands:

- obtaining consistent (but not necessarily efficient) fixed effects estimates with `xtreg, fe`;
- storing active estimation results with `estimates store fixed`;
- obtaining efficient estimates from the random-effects GLS regression with `xtreg, re` and, finally,
- running the Hausman test with `hausman fixed`.

For fixed effects models, the coefficient of determination corresponds to “$R^2$-within” reported in the model output. For random effects model, there is no direct goodness-of-fit assessment. There is, however, a way of an indirect R-squared estimation in the STATA package, which is given by the following series of commands:

- conversion of the variable set which was analysed by means of random effects model, specifying the ratio of the regional random effect to the pure residual (standard deviations) – `xtdata, clear re ratio (sigma_u/sigma_e)` and
- obtaining goodness-of-fit for the model with the converted variable set of interest via `regress` command.

In order to compare the relative importance of explanatory variables, we have computed elasticities. They indicate a percentage change in the predicted value of the dependent variable, if the median value of a particular independent variable changes by 1 percent, whereas other regressors remain constant. Median values have been used instead of means, since they are less sensitive to outliers. The general formula is

$$E_k = \beta_k \frac{\bar{x}_k}{\bar{y}}$$

To obtain elasticities for the logarithmically transformed explanatory variables, we used the command `mfx compute, eydx`. It specifies that elasticities are to be calculated in the form of $d(\ln y)/d(x)$. For the non-transformed variables, the command `mfx compute, eyex` has been applied to calculate elasticities in the form of $d(\ln y)/d(\ln x)$.

### 5.4.1 Suicide

We hypothesised that non-impulsive suicide manifests at the final stress stage – Exhaustion – which is generally characterised by behavioural patterns of passivity and escape.

Therefore, we expect suicide mortality to be explained by lacking opportunities of the population to improve its deteriorated living standards (“passivity”). Such conditions are assumed to be typical for the climatically disadvantaged agricultural areas and economically depressed industrial regions.

In terms of our explanatory variables, we hypothesise the following signs and associations (Table 5-4):
### Table 5-4 Suicide mortality and possible explanatory variables: expected signs and associations

<table>
<thead>
<tr>
<th>Variables indicating the presence of:</th>
<th>Expected Sign / Association</th>
</tr>
</thead>
<tbody>
<tr>
<td>financial losses of the population:</td>
<td></td>
</tr>
<tr>
<td>➔ mean private savings per capita <em>(lsav)</em></td>
<td>negative</td>
</tr>
<tr>
<td>(complementary) economic activities of the population:</td>
<td></td>
</tr>
<tr>
<td>➔ number of private deposit accounts per capita <em>(account)</em></td>
<td>negative</td>
</tr>
<tr>
<td>background for economic passivity of the regional populations:</td>
<td></td>
</tr>
<tr>
<td>➔ agricultural production per capita <em>(lagrC)</em></td>
<td>positive</td>
</tr>
<tr>
<td>background for economic passivity of the regional populations:</td>
<td></td>
</tr>
<tr>
<td>➔ volume of industrial production per capita <em>(loppC)</em></td>
<td>negative</td>
</tr>
<tr>
<td>economic restructuring:</td>
<td></td>
</tr>
<tr>
<td>➔ index of trade and services per capita <em>(ltraservC)</em></td>
<td>negative</td>
</tr>
<tr>
<td>risks of economic losses (unpredictable inflation development)</td>
<td></td>
</tr>
<tr>
<td>➔ Consumer Price Index <em>(lncri)</em></td>
<td>positive</td>
</tr>
<tr>
<td>hardship of climatic conditions:</td>
<td></td>
</tr>
<tr>
<td>➔ climate dummy and related variables, e.g., <em>(rc_dum)</em></td>
<td>positive</td>
</tr>
<tr>
<td>heavy binge drinking</td>
<td></td>
</tr>
<tr>
<td>➔ accidental poisoning by alcohol <em>(alcp)</em></td>
<td>positive</td>
</tr>
<tr>
<td>social tension / disruption:</td>
<td></td>
</tr>
<tr>
<td>➔ crime <em>(crime)</em></td>
<td>positive</td>
</tr>
<tr>
<td>unemployment – e.g., regional unemployment rates or chances to get employed ➔ numbers of unemployed per one vacancy <em>(uppp)</em> or ➔ unemployment rates <em>(ur)</em></td>
<td>positive</td>
</tr>
<tr>
<td>social cohesion / support:</td>
<td></td>
</tr>
<tr>
<td>➔ ethnic composition of the regional populations <em>(moslem)</em></td>
<td>negative</td>
</tr>
</tbody>
</table>

All variables listed were examined in random effect s models in relation to suicide mortality. Table 5-5 displays the “best fitting” model for 77 Russian regions, in which all coefficients are significant and demonstrate the expected signs. Among the variables considered with respect to unemployment, only “chances to get employed” *(uppp)* show a significant relationship with suicide. Due to lacking significance, the regional index of trade and services was not included in the final model.

The model indicates a good fit with the data, explaining about 75 percent of the variation in suicide mortality level across regions. The Breusch and Pagan Lagrangian multiplier test for random effects shows that region-specific effects are statistically significant. The insignificant results for the Hausman test statistic justify the application of the random effects rather than the fixed effects model, indicating that there are no systematic differences in the parameter estimates provided by the both types of models. The robustness of the overall model is illustrated by the chi-square value of the Wald test.

Based on the coefficient estimates obtained, we can conclude that the modelling results support our hypotheses. In conformity with our expectations, crime – as an expression of social disrup-
EXPLANATORY MODELS

tion, distrust and hostility – significantly increases suicide mortality level. The variable moslem indicates the presence of higher suicide mortality in the regions with a lower proportion of definite ethnic groups with better patterns of social cohesion/support assumed. The proxy-variables for heavy binge drinking (alcp) and hard climate (rc_dum) have a highly significant positive association with suicide rates.

Table 5-5 Results from panel data estimation using the GLS random effects model
Dependent variable: suicide mortality level (sui)

| Variable     | Coefficient | z-statistic | P>|z| |
|--------------|-------------|-------------|------|
| crime        | 0.004       | 5.47        | 0.000|
| alcp         | 0.284       | 18.25       | 0.000|
| lsav         | -1.301      | -3.79       | 0.000|
| account      | -5.024      | -3.67       | 0.000|
| loppC        | -2.063      | -2.57       | 0.010|
| lagrC        | 2.507       | 4.55        | 0.000|
| Incpi        | 0.897       | 6.05        | 0.000|
| rc_dum       | 11.948      | 5.39        | 0.000|
| moslem       | -0.198      | -2.9        | 0.004|
| uppp         | 0.021       | 2.99        | 0.003|
| intercept term | 31.651     | 9.05        | 0.000|

Adj. R-squared 0.7521
Number of observations 915
Number of regions 77
Wald Test [chi-square(10)] 1451.27
Prob > chi-square 0.0000

Breusch and Pagan Lagrangian Multiplier Test for Random Effects:
Null Hypothesis: Var(u) = 0
Calculated chi-square(1) = 2811.13
Prob > chi-square = 0.0000

Hausman Specification Test:
Null Hypothesis: no systematic difference in coefficients
Calculated chi-square(7) = 4.64
Prob > chi-square = 0.7038

Financial losses of the population (lsav) – inversely measured by inflation-adjusted per capita savings – acts as an important predictor of raising suicide mortality. Inflation itself (lncpi) is positively related to our dependent variable. This association confirms an independent psychologically distressing role of inflation, since its material effects are taken into account in this model with the variable lsav.

As expected, the model provided evidence that one of the aggregate-level measures of unemployment (uppp) is positively related to suicide mortality.

Since suicide is a predominantly rural phenomenon in Russia, its association with the volume of agricultural production (lagrC) seems to be plausible. The impact of the economic depression on the “suicide epidemics” is illustrated by the sign of the coefficient for “volume of industrial production” (loppC). Finally, the obtained results verify the hypothesis about the link of economic passivity of the regional populations (account) and suicide.
Now let us turn our attention to the estimation of elasticities. Evaluated at median values, elasticities (Table 5-6) demonstrate the relative importance of our explanatory variables within the time span analysed. The results show that economic passivity of the population – as measured by the proxy-variable (account) – has the strongest impact on suicide mortality in Russian regions. The rounded numerical elasticity value of 0.18 indicates that suicide mortality rate would be circa 0.18% lower if the economic environment in the regions would stimulate the development of (complementary) economic activities of the population in such a way that the median number of accounts per capita would be 1% higher than it has been.

Social disruption (crime) is the second important explanatory variable for suicide mortality, followed by the proxy for heavy binge drinking (alcp) and climatic conditions (rc_dum).

Table 5-6 Elasticities after panel data estimation using the GLS random effects model
Dependent variable: suicide mortality (sui)

| Variable | Elasticity | z-statistic | P>|z| | Median X15 |
|----------|------------|-------------|-----|----------------|
| crime    | 0.160      | 5.29        | 0.000 | 1747 |
| alcp     | 0.153      | 15.28       | 0.000 | 21.6 |
| lsav     | -0.032     | -3.83       | 0.000 | 5.35 |
| account  | -0.179     | -3.69       | 0.000 | 1.43 |
| loppC    | -0.052     | -2.53       | 0.011 | 0.73 |
| lagrC    | 0.063      | 4.62        | 0.000 | -0.07 |
| Incpi    | 0.022      | 6.19        | 0.000 | 7.49 |
| rc_dum   | 0.132      | 5.3         | 0.000 | 0.44 |
| moslem   | -0.010     | -2.98       | 0.003 | 2 |
| upp     | 0.002      | 2.97        | 0.003 | 4.6 |

y (predict) = 40.1

As stated above, the elasticities for the logarithmically transformed variables were specified in a different way than for the rest of the regressors. Therefore, the elasticities for lsav, loppC, lagrC and Incpi denote the response of suicide mortality (in percent) to a one percent change in the value of \( \exp^{X} \) (inverse function of \( LN(X) \)). That is, these elasticities are related to the variable values before the logarithmic transformation. For instance, if mean savings would drop to 209 deflated roubles per capita, (i.e. by 1% of \( \exp^{0.35} \)), and the rest of regressors would remain unchanged, the average suicide rate would be circa 0.03% higher.

Summarising the absolute values of elasticities, we can rank the importance of the explanatory variables as listed below. In this ranking, the variables are interpreted in accordance with their signs. Higher suicide rates are significantly determined by:

1. lower (complementary) economic activities of the population (account),
2. social disruption (crime),
3. heavy binge drinking (alcp),
4. hardship of climatic conditions (rc_dum),
5. higher volume of agricultural production (considered to represent economic structure with lacking opportunities to develop effective business activities – lagrC),
6. lower volume of industrial production (economic depression in industrialised regions, “hidden unemployment” – loppC),
7. lower mean private savings per capita (financial losses of the population – lsav),

\(^{15}\) Calculation of elasticity for the variable rc_dum is based on its mean value. The mean value of 0.44 indicates the proportion of regions with severe climatic conditions.
EXPLANATORY MODELS

(8) higher inflation (ln CPI),
(9) lower proportion of ethnic groups with better patterns of social cohesion/support assumed (moslem) and
(10) higher numbers of unemployed per one vacancy (i.e. lower “chances to get employed” – uppp).

The elasticities obtained from our panel data random effects model quantify the direction and strength of relationships between the explanatory variables and suicide mortality. The policy implications for suicide prevention in Russian regions are, however, difficult to quantify. Some of the concepts – e.g., heavy binge drinking – are represented by proxy-variables, which meaning is very complex. Assuming heavy binge drinking to be a “remedy” of a population with mental health problems (depression, personality disorders etc), we have to acknowledge that the association of “heavy binge drinking” and suicide mortality is confounded by the state of population’s mental health. If we will treat our alcp-variable as an expression of “marginalisation” in the given society – supposing that alcohol poisoning mortality reflects a proportion of marginalised “never-do-well alcoholics” – we need to recognise further confounders, e.g., income polarisation.

The evidence that economic passivity can be viewed as the strongest predictor of suicide mortality is consistent with the theoretical psychosocial model (Chapter 3). The next task is to examine, which factors determine the background of the economic activity/passivity in our set of regions.

For this purpose, a cluster analysis (k-means method) of the variable account (regional mean values for 1990-2001) has been carried out in order to subdivide the regions by level of economic activity of the population. Two big clusters have been identified:

(1) N=39 regions with low economic activity (circa 1.2 deposit accounts per capita in average);
(2) N=38 regions with high economic activity (circa 1.6 deposit accounts per capita in average).

Further, box and whisker graphs of means have been performed in STATISTICA 6. As it can be seen (Figure 5-15), regions with high economic activity are significantly more urbanised, they have significantly wealthier populations (higher per capita income and savings), better climate and more advanced economic restructuring (higher per capita index of retail trade and services).

Regions with low economic activities are characterised by significantly higher unemployment, lower volume of industrial and agricultural production – i.e. they are economically depressed. In the latter group of regions, there is higher alcohol poisonings mortality and higher inflation. However, these differences are non-significant, as indicated by the overlapping 95% confidence intervals. Finally, we observe significant differences in suicide mortality and crime level between the two groups of regions.

The given constellation of model and graphs results can be interpreted in accordance with our assumption that the rural population of climatically disadvantaged regions – as well as the residents of economically depressed industrial areas – are missing any opportunities to improve declining living standards via (complementary) economic activities.

Factors related to a poor economic environment represent major obstacles for effective legal and shadow business activities in this group of regions. These factors include low real purchasing capacity of the population, poor trade infrastructure, severe climate requiring higher investments etc. In these circumstances, behavioural patterns of “escape” are, probably, more common in the population. These patterns are assumed to be crucial for suicide manifestation.

The evidence supports our hypothesis of a causal link between economic passivity of the population and suicide mortality. Low aggregate-level resources of social cohesion/social support – together with maladaptive coping attempts involving heavy binge drinking – contribute to increasing suicide mortality in the regions of Russia.
Figure 5-15 Box and whisker graphs of means, by degree of economic activity of the regional populations (0-low, 1-high)
5.4.2 Homicide

As stated in Chapter 3, homicide (unpremeditated!) is hypothesised to be committed in an “attack mode” which is typical for the Alarm stage of stress. Specific behavioural patterns in Alarm status include excessive risks.

Let us assume some risk-related variables to be observable at aggregate level – e.g., economic risks from small-scale business activities of the regional populations, both in the shadow and legal sectors. We believe these activities to be especially risky during 1990-2001, since they developed in unstable and insecure economic environment. In this period, Russian regional populations were faced with “side-effects” of a rapid but incomplete economic restructuring. The post-Soviet “wild capitalism” took over the so-called administrative command economy (Gregory & Stuart 1998, p245-275), and the economic restructuring was associated with a strenuous fight for the influence spheres in the new “self-regulating” markets.

We supposed that the “best fitting” econometric models for homicide mortality will include risk-related explanatory variables. These variables may probably be used as markers of the post-Soviet “wild capitalism epoch”, characterised by an increased social tension due to wealth polarisation in a former egalitarian society.

However, some “atypical” regions may still not yet be enveloped in the “wild capitalism” risks. A glaring example of such atypism is the “less developed” Republic of Tuva (Zubarevich 2000), a doubtless outlier with respect to homicide mortality, as well as to the population living standards. Its mean homicide rate for 1990-2001 is 118 per 100 000, whereas the maximum outlying value
for the rest of the regions does not exceed 81 per 100,000 residents. As described in Chapter 2, this Republic is poorly industrialised and urbanised, and its population has the lowest per capita income – in average, more than twice lower than the mean income in other regions. The majority of Tuva’s population lives below the poverty level. Poverty and severe climatic conditions hamper a proper trade and services development.

Figure 5-16 demonstrates some of the striking gaps between Republic of Tuva and the rest of Russian regions.

Figure 5-16 Box and whisker graphs of means for Republic of Tuva and the rest of Russia’s regions
(0-regions except for Tuva; 1-Republic of Tuva)

Since the regional atypism of Tuva is necessary to be considered in the modelling of homicide mortality, we construct a dummy variable (atyp) coded 1 for Tuva and 0 for the rest of regions. In addition – given that Tuva is the poorest Russian region – we would like to test, whether the effect of income differs for Tuva and the rest of regions. In order to do this, we introduce an interactive variable (lincatyp) defined as a product of deflated per capita income (linc) and the atyp-dummy.

For the homicide mortality model, we expect the following signs and associations (Table 5-7):
The “best fitting” econometric model for homicide mortality is shown in Table 5-8. Due to lacking significance, the regional index of trade and services was not included in the final model. Other variables are significant and exhibit the expected signs.

In order to get unbiased results, we were forced to exclude one of the 77 regions from the modelling – namely, Evreiskaya avtonomnaya oblast: some of its explanatory variables had irreplaceable missing values. The final set consists of 76 regions.

The adjusted R-squared indicates a good fit with the data, explaining more than 75 percent of the variation in homicide mortality level across regions and time observed. As follows from the Breusch-Pagan Lagrangian multiplier test for random effects, the region-specific effects are statistically significant. The calculated chi-squared Hausman test statistic shows that the random effects model is consistent with the given data. Finally, the Wald test results indicate the robustness of the overall model.
Table 5-8 Results from panel data estimation using the GLS random effects model
Dependent variable: homicide mortality level (homi)

| Variable  | Coefficient | z-statistic | P>|z| |
|-----------|-------------|-------------|-----|
| crime     | 0.004       | 6.49        | 0.000 |
| alcp      | 0.197       | 11.15       | 0.000 |
| lsav      | -2.892      | -4.92       | 0.000 |
| accountd  | -11.935     | -4.43       | 0.000 |
| accsav    | 1.647       | 4.47        | 0.000 |
| linc      | 4.234       | 5           | 0.000 |
| lncri     | 2.473       | 6.11        | 0.000 |
| re_dum    | 6.291       | 3.31        | 0.001 |
| rccpi     | 0.260       | 2.42        | 0.016 |
| yed       | -4.659      | -6.38       | 0.000 |
| ye2       | 0.250       | 5.89        | 0.000 |
| atyp      | 78.191      | 10.99       | 0.000 |
| unir      | -0.065      | -2          | 0.045 |
| lincatyp  | -10.328     | -2.55       | 0.011 |
| intercept term | 23.566 | 5.35 | 0.000 |

Adj.R-squared 0.7555
Number of observations 908
Number of regions 76
Wald Test [chi-square(14)] 1662.56
Prob > chi-square 0.0000

Breusch and Pagan Lagrangian multiplier test for random effects:
Null Hypothesis: Var(u) = 0
Calculated chi-square(1) = 2012.37
Prob > chi-square = 0.0000

Hausman Specification Test:
Null Hypothesis: no systematic difference in coefficients
Calculated chi-square(10) = 3.89
Prob > chi-square = 0.9520

The signs and coefficients for the variables yed and ye2 suggest continuously rising homicide trends since 1999 (because quadratic $ax^2 + bx + c$ turns over at $x = -b / 2a$, which for our yed and ye2 coefficients is $4.659 / (2 \times 0.25) \approx 9$). This implies a crucial turning-point occurred in 1998, which may be referred to the financial crisis of August 1998.

The variables indicating the presence of risks related to both shadow (accsav) and legal (linc) economic activities of the regional population are positively associated with the homicide mortality level. This evidence is consistent with our theoretical considerations. We believe that these two variables can serve in the given context as markers of the "wild capitalism".

Let us remind that accsav is a product of mean per capita savings (natural logarithm, lsav) and the dichotomised level of economic activity of the population (accountd). Therefore, the introduction of accsav in the given constellation of variables implicates the following scenario: if per capita savings would grow, homicide mortality would decrease in all regions. However, this decrease

---

16 9 corresponds to the value of 1999-code.
EXPLANATORY MODELS

would be less noticeable in the regions with a high level of (complementary) economic activities of the population. Thus, the sign before accsav indicates a significant reduction of the protective effect of per capita savings in the regions where the level of economic activities is high – first of all, due to risks associated with these activities.

The variable characterising income (linc) should not be understood as a pure expression of absolute material wealth resulting from legal economic activities. Higher aggregate-level income may rather be referred to a higher proportion of the working population involved in risky occupations.

On the other hand, a higher aggregate-level income may be associated with growing economic inequality of the population – which may be termed in the given context as a process of marginalisation, since the share of those who are at the very bottom of the social hierarchy considerably expands. Many publications about income inequality and health assume this relationship to be negative (e.g., Lynch et al 2000; Wilkinson 1997). Therefore, we anticipate an argument that the aggregate-level relationship between income and homicide mortality may be substantially confounded by patterns of material wealth distribution. That may be true, especially in a formerly egalitarian society, where growing income inequality may result in increasing social tension and higher levels of psychosocial stress. In order to explore these links, analyses are needed that use consistent measures of income distribution across time and regions. Unfortunately, such measures were unavailable for the Russian regions within the time span analysed.

There are, however, some scholars suggesting a positive or neutral effect of income inequalities on health (Judge & Paterson 2001). The causal mechanisms are supposed to act via mitigation of poverty-associated health risks if the system of social protection and progressive tax structures is well-developed. Such system creates opportunities for spending extra taxes on public services – education, health benefits etc. As a result, there is a “trickle down” of benefits to poorer people. The period of 1990-2001 is surely not the “golden age” for the Russian system of social protection. Therefore, there is no “trickle down” of benefits – rather one may speak about “trickle up” of health-related risks.

De facto, both the poorest marginalised people and the relatively wealthy working population do have risks and stress factors related to the “wild capitalism”. For the poorest ones, “wild capitalism” means the absence of any reliable social protection. For the working population, this implies lacking legal regulations of labour security. We suppose, therefore, that aggregate-level income reflects the extent of these problems for the both population strata in all regions analysed – except for the “less developed” Republic of Tuva.

In Tuva, there is an inverse relationship between annual per capita income and homicide mortality – i.e., rising income results in decreasing homicide level, as shown by the coefficient for the interactive term lincatyp. The given results suggest two types of explanations:

(1) Tuva’s population is, probably, still living in the pre-capitalistic economy, and
(2) the income distribution in Tuva may follow another pattern than in the rest of Russia’s regions – i.e., homogeneous unrelieved poverty reigns there.

Therefore, we observe a non-linear relationship between aggregate-level income and homicide mortality.

The very special case of the atypical Republic of Tuva is captured by the positive sign of the dummy-variable atyp. The absolute material deprivation of Tuva’s residents is surely not the sole explanation of its outlying homicide rates. This region differs from the rest of Russia in many respects, and this evidence deserves a special attention of researchers.

Let us consider other explanatory variables which are assumed to play a role of transition-related stressors. Some of them were already examined in the suicide mortality model. Here we observe
absolutely identical results. Financial losses of the population (lsav) — inversely measured by inflation-adjusted per capita savings — bring about increasing homicide mortality. Inflation rates (lncpi) are positively related to our dependent variable. And, finally, lower level of (complementary) economic activities of the population (accountd) corresponds to higher homicide rates.

These similarities between the models testify to common causal stress factors lying in the economic sphere of transitional Russia. At the same time, the regional populations made use of the same “survival strategies” — those related to (mostly shadow) economic activities, multiple working places and odd jobs.

As expected, the dummy-variable for severe climatic conditions (rc_dum) is positively linked with homicide mortality. Higher costs of living and production in climatically disadvantaged areas are accelerated by inflation (rccpi), which produces an additional multiplicative effect on the level of our dependent variable.

Similar to the results of our suicide model, we observe that social tension/disruption (crime) and heavy binge drinking (alcp) significantly increase homicide mortality rates.

Finally, resources for educational skills improvement — measured as rate of graduate specialists with a university (or equivalent) degree (unir) — turned out to significantly reduce the homicide mortality level.

The relevant set of elasticities obtained from our panel data random effects model is presented in Table 5-9. Wherever possible, the elasticities were calculated at median values in order to make them less susceptible to possible outlier effects. As stated above, the elasticities for the logarithmically transformed variables or their products with dummy-variables — lsav, linc, lncpi, rccpi and lincatyp — were specified in a different way than for the rest of regressors.

| Variable17 | Elasticity | z-statistic | P>|z| | Median X |
|------------|------------|-------------|--------|--------|
| crime | 0.274 | 6.3 | 0.000 | 1734 |
| alcp | 0.159 | 10.43 | 0.000 | 21.85 |
| lsav | -0.107 | -4.81 | 0.000 | 5.36 |
| accountd* | -0.221 | -4.66 | 0.000 | 0.50 |
| accsav | 0.061 | 4.8 | 0.000 | 4.03 |
| linc | 0.156 | 4.78 | 0.000 | 1.01 |
| lncpi | 0.091 | 6.06 | 0.000 | 7.49 |
| rc_dum* | 0.101 | 3.33 | 0.001 | 0.43 |
| rccpi* | 0.010 | 2.36 | 0.018 | 2.72 |
| atyp* | 0.038 | 10.19 | 0.000 | 0.01 |
| unir | -0.057 | -1.99 | 0.046 | 24 |
| lincatyp* | -0.381 | -2.52 | 0.012 | 0.01 |

Based on the absolute elasticity values, we rank the importance of the explanatory variables as shown below. In this ranking, the variables are interpreted in accordance with their signs. Higher homicide rates are determined by:

- 137 -

17 Trend variables (yed, ye2) omitted
(1) lower income in Republic of Tuva (absence of “wild capitalism” in the atypical region – \textit{lincatyp}),
(2) social tension/disruption (\textit{crime}),
(3) lower level of (complementary) economic activities of the population (\textit{accound}),
(4) heavy binge drinking (\textit{alcp}),
(5) higher risks related to non-shadow economic activities of the population (\textit{linc}),
(6) lower mean private savings per capita (financial losses of the population – \textit{lsav}),
(7) hardship of climatic conditions (\textit{rc_dum}),
(8) higher inflation (\textit{lncpi}),
(9) higher risks related to (complementary) economic activities of the population (\textit{accsav}),
(10) lower resources for educational skills improvement (\textit{unir}),
(11) regional atypism (\textit{atyp}) and
(12) higher costs of living and production in climatically disadvantaged areas, accelerated by inflation (\textit{rccpi}).

The brief interpretation of the given modelling results is as follows:

\textbf{First}, the regions analysed are extremely heterogeneous. Since our panel data have a pronounced “cross-sectional dominant”, the variable \textit{lincatyp} reflecting the effects of the spatial heterogeneity occupies the first place in the rating of relative importance of explanatory variables. The special case of the “less developed” Republic of Tuva underlines the fact that the patterns of relationships between aggregate level income and homicide rates may differ for the regions within the same country.

\textbf{Second}, evidence from the homicide model supports our hypothesis of a causal link between the excessive risks and homicide manifestation. We can clearly distinguish the effects of the “wild capitalism markers” – i.e., the variables indicating the presence of risks related to both shadow (\textit{accsav}) and legal (\textit{linc}) economic activities of the regional populations.

\textbf{Third}, in order to explain rising homicide rates after 1998, two auxiliary variables (simple and squared trends – \textit{yed} and \textit{ye2}) were indispensable. This may testify to a massive psychological shock produced by the financial crisis of August 1998. Probably, this effect was not taken into account by other explanatory variables.

\textbf{Fourth}, some “transition-related stressors” demonstrate the same direction of relationships both with homicide and suicide mortality. These are the variables indicating the presence of economic losses of the population (\textit{lsav}) and inflation (\textit{lncpi}). Since these variables are measured in the same way in the both models, we can compare the strength of their effects on suicide and homicide mortality. To do this, we estimate elasticities for \textit{lsav} and \textit{lncpi} at the same values of the independent variables. As shown in Table 5-10, the impact of economic losses and inflation on homicide rates is significantly higher – as indicated by the elasticities and their non-overlapping confidence intervals.

\textbf{Fifth}, (complementary) economic activities of the regional population should be treated as a kind of population’s survival strategy in an unstable and insecure economic environment. The less effective are these strategies, the higher are mortality rates. This evidence results both from suicide and homicide models. Unfortunately, we can not compare the strength of effects across the two models, since the variables \textit{account} and \textit{accountd} are measured in different ways (i.e., numerically and dichotomously).

\textbf{Sixth}, similarly to the results of the suicide model, heavy binge drinking (\textit{alcp}) is a significant, but not the leading causal factor with respect to homicide mortality. Its effect on the both causes of death does not differ in magnitude, as indicated by the elasticities and their confidence intervals in Table 5-10.
Seventh, as for the other explanatory variables which are common for both causes of death analysed – i.e., social tension/disruption (crime) and severe climatic conditions (rc_dum) – we do not observe significant differences in the magnitude of their effects on suicide and homicide mortality (Table 5-10). These conclusions are based on the overlapping confidence intervals for the elasticities of these variables.

Table 5-10 Comparison of elasticities obtained for the common explanatory variables in the GLS random effects models of suicide and homicide mortality

| Variable | Suicide model | | | Homicide model | | | | Estimated at value |
|----------|---------------|---|---|---------------|---|---|---|
|          | Elasticity    | [95% Conf. Interval] | | | Elasticity    | [95% Conf. Interval] | | | |
| crime    | 0.160         | [0.10047 0.218663]   | | | 0.275         | [0.189522 0.360212]  | | | 1747 |
| alcp     | 0.153         | [0.133497 0.172779]  | | | 0.156         | [0.126774 0.185624]  | | | 21.6 |
| lsav*    | -0.032        | [-0.049101 -0.015856] | | | -0.106        | [-0.149664 -0.063082] | | | 5.35 |
| lncri*   | 0.022         | [0.0153 0.029478]    | | | 0.091         | [0.061543 0.120371]  | | | 7.49 |
| rc_dum   | 0.132         | [0.082973 0.180447]  | | | 0.102         | [0.042105 0.162266]  | | | 0.44 |

Italicised variables demonstrate significant differences in the effect magnitude.

5.4.3 Accidental poisoning by alcohol

Fatal alcohol poisonings seem to represent a marginalisation-related cause of death in chronic alcoholics rather than stress-induced mortality. Therefore, the “best fitting” econometric models should include at least two major groups of explanatory variables:

1. those assumed to describe drinking habits by regions (unir, moslem and urb) and
2. those indicating the presence of marginalisation-related processes in the regional societies, such as anomie, alienation and social isolation (captured by crime, div, ab, ur) and rapid unfavourable changes in economic environment (expressed by the variables lsav and ltraservC).

In accordance with our conceptual framework (Chapter 4) for the aggregate-level modelling of alcohol poisoning mortality, we expect the signs and associations indicated in Table 5-11.

We examine the intercorrelations of our independent variables prior to running of any regression models. The apparent need for such examination can be motivated by the ecological theories linking together rapid changes in the economic environment and weakening of social bonds (Durkheim 1897).

These associations may represent a potential source of multicollinearity in our models, since the proxy-variables for anomie/alienation/social isolation and rapid unfavourable changes in the economic environment may be highly correlated. Table 5-12 displays the correlation matrix.

Indeed, as expected, the strongest correlation is observed between the variable lsav (treated as a sign of rapid unfavourable changes in the economic environment) and unemployment rates ur (proxy for alienation/social isolation due to work loss).

Nevertheless, this correlation does not indicate any “harmful” multicollinearity, which will cause serious problems in a regression analysis ($r = -0.61$).
Table 5-11 Alcohol poisoning mortality and possible explanatory variables: expected signs and associations

<table>
<thead>
<tr>
<th>Variables indicating the presence of:</th>
<th>Expected Sign / Association</th>
</tr>
</thead>
<tbody>
<tr>
<td>financial losses of the population, rising poverty, marginalisation, increased societal tolerance of heavy binge drinking (inversely measured): mean private savings per capita ($lsav$)</td>
<td>negative</td>
</tr>
<tr>
<td>economic restructuring, increasing income inequality, marginalisation: index of trade and services per capita ($ltraservC$)</td>
<td>positive</td>
</tr>
<tr>
<td>social tension/disruption, magnitude of anomie, alienation, social isolation: crime ($crime$)</td>
<td>positive</td>
</tr>
<tr>
<td>anomie, alienation, social isolation: divorces ($div$)</td>
<td>positive</td>
</tr>
<tr>
<td>anomie, alienation, social isolation: abortions ($ab$)</td>
<td>positive</td>
</tr>
<tr>
<td>unemployment (loss of material resources, downward mobility in socioeconomic status, increase in behavioural risk factors, alienation, social isolation): unemployment rates ($ur$)</td>
<td>positive</td>
</tr>
<tr>
<td>drinking habits by educational background: education ($unir$)</td>
<td>negative</td>
</tr>
<tr>
<td>drinking habits by ethnic groups:ethnic composition of the regional population ($moslem$)</td>
<td>negative</td>
</tr>
<tr>
<td>drinking habits by urban/rural settings:urbanisation: ($urb$)</td>
<td>negative</td>
</tr>
</tbody>
</table>

Table 5-12 Correlation matrix for explanatory variables

<table>
<thead>
<tr>
<th></th>
<th>crime</th>
<th>unir</th>
<th>lsav</th>
<th>ltraservC</th>
<th>div</th>
<th>ab</th>
<th>ur</th>
<th>urb</th>
<th>ur</th>
<th>moslem</th>
</tr>
</thead>
<tbody>
<tr>
<td>crime</td>
<td>1</td>
<td>-0.02</td>
<td>-0.40</td>
<td>-0.13</td>
<td>0.24</td>
<td>0.24</td>
<td>0.14</td>
<td>0.22</td>
<td>-0.39</td>
<td></td>
</tr>
<tr>
<td>unir</td>
<td>-0.02</td>
<td>1</td>
<td>0.00</td>
<td>0.27</td>
<td>0.06</td>
<td>-0.26</td>
<td>0.23</td>
<td>0.09</td>
<td>0.06</td>
<td></td>
</tr>
<tr>
<td>lsav</td>
<td>-0.40</td>
<td>0.00</td>
<td>1</td>
<td>0.60</td>
<td>0.05</td>
<td>-0.15</td>
<td>0.21</td>
<td>-0.61</td>
<td>-0.09</td>
<td></td>
</tr>
<tr>
<td>ltraservC</td>
<td>-0.13</td>
<td>0.27</td>
<td>0.60</td>
<td>1</td>
<td>0.26</td>
<td>-0.06</td>
<td>0.46</td>
<td>-0.28</td>
<td>-0.17</td>
<td></td>
</tr>
<tr>
<td>div</td>
<td>0.24</td>
<td>0.06</td>
<td>0.05</td>
<td>0.26</td>
<td>1</td>
<td>0.10</td>
<td>0.50</td>
<td>-0.23</td>
<td>-0.35</td>
<td></td>
</tr>
<tr>
<td>ab</td>
<td>0.24</td>
<td>-0.26</td>
<td>-0.15</td>
<td>-0.06</td>
<td>0.10</td>
<td>1</td>
<td>0.11</td>
<td>-0.31</td>
<td>-0.33</td>
<td></td>
</tr>
<tr>
<td>urb</td>
<td>0.14</td>
<td>0.23</td>
<td>0.21</td>
<td>0.46</td>
<td>0.50</td>
<td>0.11</td>
<td>1</td>
<td>-0.23</td>
<td>-0.30</td>
<td></td>
</tr>
<tr>
<td>ur</td>
<td>0.22</td>
<td>0.09</td>
<td>-0.61</td>
<td>-0.28</td>
<td>-0.23</td>
<td>-0.31</td>
<td>-0.23</td>
<td>1</td>
<td>0.26</td>
<td></td>
</tr>
<tr>
<td>moslem</td>
<td>-0.39</td>
<td>0.06</td>
<td>-0.09</td>
<td>-0.17</td>
<td>-0.35</td>
<td>-0.33</td>
<td>-0.30</td>
<td>0.26</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Let us have a look at the “best fitting” random effects model (Table 5-13) for 77 Russian regions. All of the independent variables are significant and show the expected signs. The “explained” fraction of variance of alcohol poisoning mortality is slightly above 51%, as indicated by the moderate value of adjusted R-squared. However, it is difficult to expect a “perfect fit” with the data, if an important predictor of alcohol poisoning mortality is missing in the given set of explanatory variables – i.e., a proxy-variable for the regional “supply” with cheap low-quality alcoholic beverages, toxic counterfeits and moonshine. Due to lacking data on availability and prices of alcohol.
EXPLANATORY MODELS

and its surrogates, an important block of our conceptual scheme is omitted in the econometric model (see Scheme 4-1, Chapter 4).

Table 5-13 Results from panel data estimation using the GLS random effects model
Dependent variable: accidental poisoning by alcohol, mortality level (alcp)

| Variable     | Coefficient | z-statistic | P>|z| |
|--------------|-------------|-------------|------|
| crime        | 0.003       | 2.76        | 0.006|
| unir         | -0.119      | -2.33       | 0.020|
| lsav         | -4.996      | -6.48       | 0.000|
| ItraservC    | 4.599       | 3.42        | 0.001|
| div          | 6.502       | 11.38       | 0.000|
| ab           | 0.165       | 4.06        | 0.000|
| urb          | -0.410      | -3.66       | 0.000|
| ur           | 0.225       | 2.15        | 0.032|
| moslem       | -0.241      | -2.55       | 0.011|
| intercept term | 38.000   | 3.35        | 0.001|

Adj.R-squared: 0.5135
Number of observations: 915
Number of regions: 77
Wald Test [chi-square(9)]: 644.36
Prob > chi-square: 0.0000

Breusch and Pagan Lagrangian multiplier test for random effects:
Null Hypothesis: Var(u) = 0
Calculated chi-square(1) = 1465.76
Prob > chi-square = 0.0000

Hausman Specification Test:
Null Hypothesis: no systematic difference in coefficients
Calculated chi-square(8) = 81.43
Prob > chi-square = 0.0000
(V_b-V_B is not positive definite)

The calculated chi-squared Hausman test statistic points out to statistically significant differences between the fixed and random effects estimates. Therefore, strictly speaking, we can not apply the random effects estimation in this case, despite the presence of statistically significant regional random effects, as indicated by the Breusch and Pagan Lagrangian multiplier test statistic. We should go with the fixed effects model.

Table 5-14 displays parameter estimates obtained with the fixed effects model. The key argument in favour of this model is the presence of an “omitted variable” (region-specific component of the error term \( u_i \)), which is correlated with our regressors. This problem may refer to availability of alcohol and its surrogates – at least with respect to its time-constant component. The given type of model is considered to be robust in the presence of unobserved regional effects \( u_i \), violating the assumption of strict exogeneity of regressors.\(^\text{18}\) The overall model significance is specified by the F-test statistics.

\(^{18}\) For unobserved regional effects, the strict exogeneity assumption can be written as follows: \( corr(u_i, X) = 0 \).
Table 5-14 Results from panel data estimation using the fixed effects (within) regression model
Dependent variable: accidental poisoning by alcohol, mortality level (alcp)

| Variable | Coefficient | t-statistic | P>|t| |
|----------|-------------|-------------|------|
| crime    | 0.004       | 2.97        | 0.003|
| unir     | -0.135      | -2.34       | 0.020|
| lsav     | -4.110      | -5.23       | 0.000|
| ltraservC| 3.588       | 2.63        | 0.009|
| div      | 7.391       | 12.29       | 0.000|
| ab       | 0.175       | 4.1         | 0.000|
| urb      | -0.996      | -3.22       | 0.001|
| ur       | 0.308       | 2.88        | 0.004|
| moslem   | (dropped)   |             |      |
| intercept term | 67.161   | 2.87        | 0.004|

R-squared (within) = 0.4473
Number of observations = 915
Number of regions = 77
F(8,830) = 83.98
Prob > F = 0.0000

corr(u_i, Xb) = -0.4723

Since the fixed effects model "differenced out" the effects of time-invariant variable moslem (drinking habits by ethnic groups), the overall goodness-of-fit is somewhat lower than in the random effects model. \(R^2\)-within indicates that circa 45 percent of the regional variation in alcohol poisoning mortality is explained.

In essence, the results of the both models are, however, identical – as regards the direction of effects and statistical significance of the explanatory variables. We obtain the same ranking of the relative importance for our independent variables. Table 5-15 presents the sets of elasticities obtained at median values from the both types of models. The variables are sorted by the absolute elasticity values in descending order.

Table 5-15 Elasticities after panel data estimation using the fixed and random effects model
Dependent variable: accidental poisoning by alcohol, mortality level (alcp)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Fixed effects model</th>
<th>Random effects model</th>
<th>Median X</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Elasticity</td>
<td>z-statistic</td>
<td>P&gt;</td>
</tr>
<tr>
<td>urb</td>
<td>-2.523</td>
<td>-3.29</td>
<td>0.001</td>
</tr>
<tr>
<td>div</td>
<td>1.089</td>
<td>11.86</td>
<td>0.000</td>
</tr>
<tr>
<td>ab</td>
<td>0.439</td>
<td>3.99</td>
<td>0.000</td>
</tr>
<tr>
<td>crime</td>
<td>0.260</td>
<td>2.93</td>
<td>0.003</td>
</tr>
<tr>
<td>lsav</td>
<td>-0.151</td>
<td>-5.41</td>
<td>0.000</td>
</tr>
<tr>
<td>ltraservC</td>
<td>0.132</td>
<td>2.66</td>
<td>0.008</td>
</tr>
<tr>
<td>unir</td>
<td>-0.120</td>
<td>-2.37</td>
<td>0.018</td>
</tr>
<tr>
<td>ur</td>
<td>0.102</td>
<td>2.84</td>
<td>0.004</td>
</tr>
<tr>
<td>moslem</td>
<td>(no effect)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

y predicted= 27.1  y predicted= 28.2

Below we discuss the given results.
The variable \( \text{urb} \) has the strongest impact on fatal alcohol-related outcome suggesting the crucial role of drinking habits by urban/rural settings. The negative signs before its coefficients and elasticities obtained both from fixed and random effects models signify the following direction of relationship: the less urbanised are the regions, the higher is the level of alcohol poisoning mortality. These results are plausible, as higher mean incidence of alcohol poisonings is observed in the rural areas (Figure 5-17).

Three of four variables assumed to indicate the presence of anomie, alienation and social isolation in the regions analysed occupy the subsequent places in the rating of the relative importance. These variables are divorces (\( \text{div} \)), abortions (\( \text{ab} \)) and crime (\( \text{crime} \)). Since all aggregate-level measures of anomie, alienation and social isolation are positively related to our dependent variable (including ILO-unemployment rates \( \text{ur} \)), we conclude that these marginalisation-related processes significantly increase alcohol poisoning mortality.

The proxy-measures of rapid unfavourable changes in economic environment (\( \text{l sav} \) and \( \text{l traservC} \)) demonstrate relatively close absolute elasticity values – respective, 0.15 and 0.13 from the fixed effects model. Since both variables are logarithmically transformed, their elasticities denote the response of alcohol poisonings mortality (in percent) to a one percent change in the value of \( \exp \beta \) (inverse function of \( \ln(\bar{X}) \))\(^{19} \). The signs of the coefficients and elasticities for both regressors indicate their oppositely directed associa-

\(^{19}\) These elasticities are related to the variable values before the logarithmic transformation. For instance, if mean savings would drop to 209 deflated roubles per capita, (i.e., by 1% of \( \exp 5.32 \)), and the rest of regressors would remain unchanged, the average alcohol poisonings mortality would be circa 0.15% higher (in accordance with the fixed effects model).
tions with the dependent variable – positive for the index of trade and services per capita ($ltraservC$) and negative for mean private savings per capita ($lsav$).

It is likely that the development of consumer-oriented branches – i.e., trade and services – has been considerably confounded by growing economic inequality, which can not be controlled for with the given set of regional data. In the course of the economic transition there was a major alteration in the structure of employment in favour of trade and services. Major changes in the structure of employment go often hand in hand with rising earnings inequality (Cahuc & Zylberberg 2004 p593).

The Russian type of restructuring has not improved the financial situation of workers employed in the depressed manufacturing branches, e.g., in defence industry or heavy engineering. If we will proceed from the assumption of a relative pre-transitional abundance of manufacturing manpower, we may hypothesise that the majority of the Russian employees experienced a significant shrinkage of their real wages due to the general economic crisis, whereas a smaller proportion of those employed in trade and services were the principal beneficiaries.

The expanding sectors of trade and services could not absorb the whole manufacturing manpower from the crisis-affected enterprises. Therefore, we deal with a particular type of economic polarisation, in which the majority of the population endured financial hardship and impoverishment. This phenomenon has probably spurred the process of marginalisation, since the social protection system has not been able to support the people who came off a loser in the course of the economic restructuring.

In combination, the relationships of $lsav$ and $ltraservC$ with the dependent variable can be interpreted as follows: the more pronounced are financial losses of the population – approximated by mean private savings per capita $lsav$ – and the deeper is the economic polarisation, the higher is the level of marginalisation-related mortality due to accidental alcohol poisonings. These results are consistent with our theoretical considerations.

Interesting is the fact that the absolute values of elasticities indicate the lower relative importance of economic marginalisation-related forces – measured by $lsav$ and $ltraservC$ – as compared to the social factors (anomie, alienation and social isolation proxied by $div$, $ab$ and $crime$).

One possible explanation for the inferior rank of the economic variables relates to an inaccuracy of aggregate-level measurements – e.g., underestimation of informal/shadow business activities in trade and services or non-bank savings of the population in “hard currency”. The next problem of measurement is that $lsav$ and $ltraservC$ may not be the optimal approximation of “rising poverty” and “economic restructuring” or “increasing income inequality”, respective. Finally, economic reasons may really play a subordinate role for the sick marginal population of chronic alcoholics (there is nothing to lose), while social factors may still be important – e.g., involvement in small-scale criminal activities ($crime$) etc. However, such individual-level inferences from the aggregate-level evidence are questionable.

(4) As expected, the aggregate-level measure of education ($unir$) significantly reduces alcohol poisonings mortality. Let us remind that $unir$ is represented by the regional rates of graduate specialists with a university – or equivalent – degree per 10 000 inhabitants. It is reasonable that these rates are higher in the urbanised regions. However, the effects of urbanisation are taken into account in our models with the variable $urb$. Therefore, we observe the impact of drinking habits by educational background, adjusted for urbanisation.
EXPLANATORY MODELS

(5) The effects of drinking habits by ethnic groups (*moslem*) elude estimation with the fixed effects model. They are, nevertheless, important – as indicated by significance of *moslem* in the random effects model. Figure 5-18 illustrates significantly lower alcohol poisonings level in the regions with a bigger proportion of ethnic groups with Moslem, Caucasian or Jewish background.

Figure 5-18 Box and whisker graphs of means (alcohol poisonings level in different types of settings), by proportion of specified ethnic groups

![Graphs showing accidental poisonings by alcohol in different settings](image)

(0) - regions with a low proportion of ethnic groups with Moslem, Caucasian and Jewish background (*moslem*≤5%), N=59;

(1) - regions with a high proportion of ethnic groups with Moslem, Caucasian and Jewish background (*moslem*>5%), N=18

In general, the models suggested indicate the presence of an unobserved cross-section region-specific heterogeneity – i.e., variability of mortality patterns which can not be captured by the given set of explanatory variables. Despite this problem (omitted variables), the modelling results support our basic hypotheses (Chapter 4). All of the proposed measures for the concepts of “drinking habits”, “anomie, alienation and social isolation”, as well as “rapid unfavourable changes in economic environment” turned out to play a statistically significant role in determining regional patterns of alcohol poisoning mortality. Our conclusion is, therefore, that the level of fatal alcohol poisonings depends on specific regional drinking habits and the extent of marginalisation-related processes.

Other essential risk factors are likely to exist, beyond those analysed in this chapter. We believe that one of them relates to availability of low-quality alcohol. Since we do not have any reliable data on this determinant of alcohol poisoning mortality, its impact could not be assessed.

- 145 -
### 5.5 Technical appendix

#### Table 5-16 List of variables used in the “best fitting” model of suicide mortality

<table>
<thead>
<tr>
<th>Variable (name)</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>suicide (sui)</td>
<td>SDR per 100 000 inhabitants</td>
</tr>
<tr>
<td>crime (crime)</td>
<td>per 100 000 inhabitants</td>
</tr>
<tr>
<td>accidental poisoning by alcohol (alcp)</td>
<td>SDR per 100 000 inhabitants</td>
</tr>
<tr>
<td>mean private savings per capita (lsav)</td>
<td>thousands of 1991 roubles per capita (transformed to natural logarithm)</td>
</tr>
<tr>
<td>number of private deposit accounts per capita (account)</td>
<td>numbers of accounts per capita</td>
</tr>
<tr>
<td>volume of industrial production per capita (loppC)</td>
<td>thousands of 1991 roubles per capita (transformed to natural logarithm)</td>
</tr>
<tr>
<td>agricultural production per capita (lagrC)</td>
<td>thousands of 1991 roubles per capita (transformed to natural logarithm)</td>
</tr>
<tr>
<td>Consumer Price Index (lncpi)</td>
<td>CPI 1991 =1 (transformed to natural logarithm)</td>
</tr>
<tr>
<td>climate dummy (rc_dum)</td>
<td>0=“good climate”, 1=“bad climate”</td>
</tr>
<tr>
<td>ethnic composition of the regional population (moslem)</td>
<td>percent of ethnic groups with Moslem, Caucasian or Jewish background</td>
</tr>
<tr>
<td>numbers of unemployed per one vacancy (uppp)</td>
<td>numbers of unemployed persons per vacancy</td>
</tr>
</tbody>
</table>

#### Table 5-17 List of variables used in the “best fitting” model of homicide mortality

<table>
<thead>
<tr>
<th>Variable (name)</th>
<th>Unit / Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>homicide (sui)</td>
<td>SDR per 100 000 inhabitants</td>
</tr>
<tr>
<td>crime (crime)</td>
<td>per 100 000 inhabitants</td>
</tr>
<tr>
<td>accidental poisoning by alcohol (alcp)</td>
<td>SDR per 100 000 inhabitants</td>
</tr>
<tr>
<td>mean private savings per capita (lsav)</td>
<td>thousands of 1991 roubles per capita (transformed to natural logarithm)</td>
</tr>
<tr>
<td>dichotomised number of private deposit accounts per capita (accountd)</td>
<td>0=“low number of accounts” 1=“high number of accounts”</td>
</tr>
<tr>
<td>interactive term (accsav)</td>
<td>accsav = lsav × accountd</td>
</tr>
<tr>
<td>mean annual income per capita (linc)</td>
<td>thousands of 1991 roubles per capita yearly (transformed to natural logarithm)</td>
</tr>
<tr>
<td>Consumer Price Index (lncpi)</td>
<td>CPI 1991 =1 (transformed to natural logarithm)</td>
</tr>
<tr>
<td>climate dummy (rc_dum)</td>
<td>0=“good climate”, 1=“bad climate”</td>
</tr>
<tr>
<td>interactive term (rcpci)</td>
<td>rcpci = rc_dum × ln(cpi)</td>
</tr>
<tr>
<td>trend (yed)</td>
<td>{1990=0; 1991=1; 1992=2… 2001=11}</td>
</tr>
<tr>
<td>squared trend (ye2)</td>
<td>ye2 = yed^2</td>
</tr>
<tr>
<td>regional atypism dummy (atyp)</td>
<td>0=“typical regions”, 1=“atypical region” (Republic of Tuva)</td>
</tr>
<tr>
<td>interactive term (lincatyp)</td>
<td>lincatyp = linc × atyp</td>
</tr>
<tr>
<td>education (unir)</td>
<td>graduate specialists per 10 000 inhabitants</td>
</tr>
</tbody>
</table>
EXPLANATORY MODELS

Table 5-18 List of variables used in the “best fitting” models of alcohol poisonings mortality

<table>
<thead>
<tr>
<th>Variable (name)</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>accidental poisoning by alcohol</td>
<td>SDR per 100 000 inhabitants</td>
</tr>
<tr>
<td>(alcp)</td>
<td></td>
</tr>
<tr>
<td>crime (crime)</td>
<td>per 100 000 inhabitants</td>
</tr>
<tr>
<td>education (unir)</td>
<td>graduate specialists per 10 000 inhabitants</td>
</tr>
<tr>
<td>mean private savings per capita</td>
<td>thousands of 1991 roubles per capita</td>
</tr>
<tr>
<td>(lsav)</td>
<td>(transformed to natural logarithm)</td>
</tr>
<tr>
<td>index of trade and services per</td>
<td>thousands of 1991 roubles per capita</td>
</tr>
<tr>
<td>capita (ltraservC)</td>
<td>(transformed to natural logarithm)</td>
</tr>
<tr>
<td>divorces (div)</td>
<td>per 1000 inhabitants</td>
</tr>
<tr>
<td>abortions (ab)</td>
<td>per 1000 women (15-49 years)</td>
</tr>
<tr>
<td>urbanisation (urb)</td>
<td>percent (urban population)</td>
</tr>
<tr>
<td>unemployment rates (ur)</td>
<td>percent (of the total labour force)</td>
</tr>
<tr>
<td>ethnic composition of the regional population (moslem)</td>
<td>percent of ethnic groups with Moslem, Caucasian or Jewish background</td>
</tr>
</tbody>
</table>

Table 5-19 Descriptive statistics for the variables used

<table>
<thead>
<tr>
<th>Variable</th>
<th>Obs.</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>sui</td>
<td>924</td>
<td>38.93</td>
<td>16.48</td>
<td>0.8</td>
<td>97.9</td>
</tr>
<tr>
<td>homi</td>
<td>924</td>
<td>26.33</td>
<td>16.63</td>
<td>2.7</td>
<td>158.4</td>
</tr>
<tr>
<td>alcp</td>
<td>924</td>
<td>25.69</td>
<td>18.62</td>
<td>0.5</td>
<td>113.5</td>
</tr>
<tr>
<td>urb</td>
<td>924</td>
<td>69.25</td>
<td>12.77</td>
<td>23.6</td>
<td>100</td>
</tr>
<tr>
<td>div</td>
<td>924</td>
<td>4.06</td>
<td>1.13</td>
<td>1.1</td>
<td>11.2</td>
</tr>
<tr>
<td>moslem</td>
<td>924</td>
<td>7.35</td>
<td>16.14</td>
<td>0</td>
<td>87.6</td>
</tr>
<tr>
<td>crime</td>
<td>918</td>
<td>1816.8</td>
<td>585.98</td>
<td>611</td>
<td>3870</td>
</tr>
<tr>
<td>unir</td>
<td>924</td>
<td>27.47</td>
<td>15.71</td>
<td>0</td>
<td>164</td>
</tr>
<tr>
<td>ab</td>
<td>924</td>
<td>67.33</td>
<td>16.22</td>
<td>18</td>
<td>117</td>
</tr>
<tr>
<td>koppC*</td>
<td>924</td>
<td>2.20</td>
<td>1.12</td>
<td>0.04</td>
<td>6.6</td>
</tr>
<tr>
<td>l agrC*</td>
<td>898</td>
<td>1.10</td>
<td>0.69</td>
<td>0.13</td>
<td>6.1</td>
</tr>
<tr>
<td>l traservC*</td>
<td>924</td>
<td>2.16</td>
<td>1.18</td>
<td>0.44</td>
<td>12.4</td>
</tr>
<tr>
<td>lncpi*</td>
<td>924</td>
<td>2857.33</td>
<td>3458.59</td>
<td>1</td>
<td>30488.2</td>
</tr>
<tr>
<td>ur</td>
<td>921</td>
<td>8.88</td>
<td>5.97</td>
<td>0</td>
<td>32</td>
</tr>
<tr>
<td>uppp</td>
<td>924</td>
<td>12.11</td>
<td>27.31</td>
<td>0</td>
<td>467.5</td>
</tr>
<tr>
<td>lsav*</td>
<td>923</td>
<td>0.46</td>
<td>0.60</td>
<td>0.03</td>
<td>3.1</td>
</tr>
<tr>
<td>account</td>
<td>923</td>
<td>1.39</td>
<td>0.34</td>
<td>0.42</td>
<td>2.7</td>
</tr>
<tr>
<td>linc*</td>
<td>908</td>
<td>3.22</td>
<td>1.78</td>
<td>0.88</td>
<td>15.2</td>
</tr>
</tbody>
</table>

* prior to logarithmic transformation
6.1 Aggregate-level approach to analysing unnatural causes of death

Our findings indicate that specific behavioural patterns manifesting in different stages of stress can be assessed at the population level. Therefore, the measures of “passivity” or “excessive risks” can probably be viewed as determinants of violent mortality in Russian regions.

The observed association of suicide and “passivity” is consistent with findings from individual-level studies. Pollock & Williams (2004) identified that suicide attempters are significantly more passive in their problem-solving style than non-psychiatric controls, and these differences persisted despite change in mood after psychiatric treatment of suicidal patients. The group of suicide attempters was even more “passive” than psychiatric controls matched by age, gender and education, albeit these differences were not found to be statistically significant. Orbach and colleagues (1990) found significantly more “avoidance” in problem-solving styles of suicide attempters, compared to non-suicidal patients.

Several studies pointed out to the existence of links between non-premeditated violence – including its extreme expression (homicide) – and “mindless” risky behaviour at extreme levels of emotional arousal (Cornell et al 1996; Salfati & Canter 1999).

Since we deal with aggregate-level data, we have to be very cautious when interpreting the associations “excessive risks – homicide” and “passivity – suicide”. However, even when studying individual-level risk factors, ecological studies play an essential part in generating hypotheses to their potential causes ( Pearce 2000). We can assume that specific environmental, societal and economic conditions encourage readiness to risk – or prohibit successful opportunities to improve living standards via increased “activity”. In other words, these conditions are to be understood as population-level risk factors setting the pathways by which individual-level characteristics affect health. Ecological studies enable an insightful analysis of population-level effect modifiers or determinants of exposure to individual-level risk factors.

We believe ecological studies to be the design of choice in addressing the issues of transition-related stress or marginalisation and their impact on mortality. It is increasingly recognised that traditional risk factors cannot sufficiently explain mortality variations in countries experiencing the socio-economic transition (Weidner & Cain 2003; Pearce 2000; Ginter 1998). There are powerful social and economic forces which operate at the population level ( Brenner 2003; Bobak & Marmot 1996; Velichkovskii 2002). In our paper, these forces have been analysed as “core transition-related stressors” or “unfavourable socioeconomic environment” in relation to behavioural stress outcomes (suicide and homicide) and alcohol poisonings, respectively.

6.2 Material deprivation and mortality

For all causes of death examined, we observed identical results: the more financial loss by the population experienced, the higher the mortality level. We hypothesised that the mean private savings rate would reflect dynamically developing material deprivation. This phenomenon has both psychological and social effects. First, it is assumed to cause a growing incongruity between material expectations and reality and, thereby, to induce stress reactions. Second, it can be treated as a sign of rapid unfavourable changes in the Russian regional economic environment, which reinforce the process of marginalisation.

The concept of material deprivation (Gordon & Spicker 1999 p10-11) is a key point of debate in modern epidemiological research. It is generally believed that there is a close association between absolute or relative deprivation and poor health. However, the evidence of links between mortality and different measures of this concept is rather contradictory sometimes, especially for
DISCUSSION

homicide. Specifically, the divergence of results observed in different studies can be explained by:

- different measures used to represent the concept,
- different shapes of relationships between the particular outcome and the measure of deprivation in a given population, as well as
- different constellations of explanatory variables providing a control for confounding or effect modification.

Private savings is a quite uncommon measure to approximate material deprivation. Using a very broad search strategy, we identified only 12 article citations in the National Library of Medicine dealing with “household savings” and one citation dealing with “precautionary savings”\textsuperscript{20}.

To assess material deprivation and related concepts – e.g., poverty, socioeconomic position of populations – at an area level, there exist a substantial number of indicators proposed. The most widespread measures include mean real per capita income, inflation-adjusted Gross Domestic Product (GDP) or Gross Regional Product (GRP) per capita, proportion of the population below a definite “poverty line” etc (Krieger 2001; ILO 2001; Lynch et al 2000).

However, in Russian regional settings, these commonly used measures have some important limitations that have been widely discussed by many authors (Zubarevich 1998; Martynov et al 1998; ILO 2001). In particular, there are serious problems of data availability, completeness, as well as a considerable underestimation of shadow economy effects.

\subsection*{6.2.1 Limitations of commonly used measures of material deprivation in the Russian regional context}

Official regional and national statistics of mean per capita income fails to take into account the full amount of “black” and “grey” cash earnings (Schneider & Enste 2000). Here are some citations giving an idea of the extent and the numerous colour gradations of shadow incomes.

Radaev (2002) studied personal and civil motives of Russian business leaders for bringing their activities out of the shadow, as well as the stereotypes of the ordinary people with regard to existing business rules. In November 2001 there was an interview on the shadow economy issues at one of the leading radio stations (“Echo of Moscow”). The following question was put on interactive voting: “Is it possible to run a business in Russia today without breaking the laws?” About 800 calls over few minutes have been received. Ninety four percent of the respondents said “No, it is not possible”.

Martynov et al (1998) measured the difference between income and expenditures and savings reported by GOSKOMSTAT for 1992-1995. The authors concluded that the population spent and set aside more money than “allowed for” by the officially published income.

In all types of enterprises, there is a wide-spread practice of unofficial payment of “wages in envelopes” through “grey schemes” and double bookkeeping (Friedman & Verbetsky 2001). Such payments constitute nowadays about 40% of salaries, as stated by the Pension Fund Chairman Gennadii Batanov (Regnum News Agency 2005).

The extent of shadow earnings may systematically vary across regions and over time. In 1995 the share of “unaccounted earnings” varied by regions from 42 to 73 percent (Martynov et al 1998).

\textsuperscript{20} Requested for: “household savings” [in title or abstract]; “precautionary savings” [in title or abstract]. No items found with requests (“savings per capita” [in title or abstract] OR “per capita savings” [in title or abstract]), (“savings of the population” [in title or abstract] OR “population’s savings” [in title or abstract]) 16 July 2005.
DISCUSSION

As for the data on the Gross Regional Product (GRP) per capita, they were only available for the period 1995-2000 in our panel data source.

Apart from the problems of data availability, GRP has some further limitations. It does not take into account the total volume of “non-market services” – such as defence, public administration etc – provided by the state institutions within the regional areas (GOSKOMSTAT 2002).

Similarly to GDP, it can not be fully adjusted for the shadow economy and bartering (Soubbotina 2004 p14). Some scholars have tried to estimate the national size of the shadow economy in Russia (Johnson et al 1997 p183; Johnson et al 1998 p351; Schneider 2003 p27). Depending on the year and estimation methods, the figures fluctuate from 27 to 45.1 percent of “official GDP”. Being expressed as a proportion of labour force engaged in shadow economic activities, it is amount to 40.9 percent.

The extent to which the economy of Russian regions is covered through official GRP statistics may systematically differ between the regions and across time.

Finally, we could not examine the effects of poverty measured as a proportion of the population below a definite “poverty line” – primarily, due to lack of sufficient data.

6.2.2 Private savings

We suppose the mean per capita savings to be less biased by the systematic variations of informal activities, as compared to the other measures available – e.g., official per capita income. Savings can be viewed as a derivative function both from legal and shadow incomes. Even recognising the fact that GOSKOMSTAT data on savings may be seriously inaccurate for some reasons, we believe this measure of material wealth – or losses of wealth resulting in deprivation – to represent the matter of choice for our study population.

Private savings are often discussed in the literature as an important determinant of individual wealth accumulation. In order to understand the role of savings, it is necessary to comprehend the key psychological reasons driving people to save their money. Clearly, there is a wide range of motives influencing savings decisions.

Let us consider the situation prior to 1992. During the socialist era, voluntary private savings took place, in particular to finance durable consumer goods (Schrooten & Stephan 2003). In the economy of chronic shortage, the lack of consumer goods motivated what was called “involuntary” or “forced” savings (Denizer & Wolf 2000). One could never be sure as to when a valued but hard-to-get good might suddenly become available, so households and individuals preferred to save for such a contingency. The motives of the so-called “precautionary savings” for a “rainy day” were not the leading ones. Socialist governments guarantied permanent full employment, thereby providing households with an extremely high degree of predictability over their income flows. Employees faced a relatively smooth lifetime income profile. Wage differentials across age cohorts were kept relatively small and pensions tended to represent a higher percentage of pre-retirement income (Ickes 1993 p221). In general, the key idea of savings – whether voluntary or involuntary – was the delayed consumption.

After the price liberalisation in 1992 private savings were ravaged by inflation rates of more than 1000 percent per year (Easterly & Cunha 1994). Therefore, the Russian population suffered an
DISCUSSION

enormous psychological shock, since any prospects for future consumption with the money saved were suddenly made null and void.

The beginning of the socioeconomic transition altered the motives for private savings rather dramatically. Decreased job security, increased income instability and a massive deterioration of the publicly financed social protection system forced households to rely upon precautionary savings to smooth consumption (Denizer & Wolf 2000).

Precautionary savings are often discussed in the literature from the standpoint of “life-cycle” and “permanent income” hypotheses (Friedman 1957). Consumption, from this perspective, does not respond to transitory fluctuations in current income. Rather, people adjust savings to keep consumption relatively constant. That is, an individual may save, when his income grows in order to finance consumption in later years, if income declines. Therefore, savings depend on income. Based on individual-level data of the Russian Longitudinal Monitoring Survey, Gregory and colleagues (1999) found poor households to be net dis-savers, whereas higher-income families save roughly one-third of their income.

Recent studies have attempted to explore the links between household savings and health or mortality. Using multivariate cross-sectional regression methods, Aihara & Iki (2003) observed an inverse association between male suicide rates and the amount of household savings in 47 Japanese prefectures for 1995-2000. These results are consistent with our findings on the Russian data set.

Some scholars have tried to explain the causes of lower savings among the sick individuals. Smith (1999) suggests that the major causes of wealth depletion include:

- a decline in labour supply that reduces income,
- downward revisions in life expectancy that allow spending of precautionary savings, and
- the reduced likelihood of leaving large inheritances.

Gregory et al (1999) discovered a paradoxical U-shaped savings-age relationship for the Russian population. This phenomenon has been explained by the fact of drastic reduction of life expectancy in middle-aged men, who are not expected to survive to a retirement age.

These studies, are, however the subject to several empirical difficulties. Since current health – or a population’s life expectancy – is in part influenced by the past socioeconomic status and since socioeconomic conditions at different ages are correlated, there may be a potential endogeneity problem. This problem can be mitigated by looking at the behaviours of people in the past – for instance, if analyses of changes in wealth and health will be based on a panel data approach with a relatively long time span examined. In this respect, our study has a methodological advantage.

Inaccuracy of measurement due to lacking regional data on “under-the-mattress” private savings – both in domestic and foreign currency – is the most serious limitation of our study. Kashin (2000) analysed the structure of the households’ financial assets in Russia and observed a gradual decline of the share held as deposits: it dropped from 67% to 26% from 1990 to 1993 and down to 17% in 1999. At the same time, the share held as “hard currency” has expanded from an estimated 0% in 1990 to 55% in 1999. Probably, a more precise measure of real private savings would have resulted in stronger relationships between savings and mortality in the models employed.²⁵

²⁵ In a bivariate correlation analysis, the strength of relationships between mortality and savings demonstrates a downward trend from 1990 to 2001. For instance, for the relationships between suicide and savings, Pearson’s correlation coefficient is amount to -0.46 (p<0.000, N=77) in 1990. For 2001, it is equal to -0.28 (p=0.01, N=77).
6.2.3 Income and homicide in Russian regions – evidence of non-linear relationships

As stated above, income has been widely employed as an “established” measure of material deprivation. It constitutes a component of the socioeconomic status (SES). At the individual level of analysis, low SES in general, as well as low individual or neighbourhoods’ income in particular act usually as powerful predictors of violent and alcohol-related deaths (Bucca et al 1994; Gould et al 1996; Hawkins 1990; Gjelsvik et al 2004; Yoon et al 2003; Poikolainen & Vuori 1985).

However, at the aggregate level, the evidence is rather heterogeneous. Many studies have consistently found significantly negative relationships between per capita income and suicide rates (Quinney 1965; Lester 1996; Wu 2003; Cantor et al 1995; Ferrada-Noli 1996). For homicide rates, the findings are more conflicting. By means of simple correlations, Pickett et al (2005) identified higher per capita income to be positively associated with higher homicide rates within a group of the richest countries. This association turned to be non-significant in the set of the USA states. Contrariwise, the panel data analysis of Andrienko (2001) performed on a set of 70 Russian regions for 1990-1998 revealed higher homicide rates to be significantly determined by lower per capita income, adjusted for the effects of income inequality and education.

Our panel data analysis included more administrative areas and a longer time span, providing, therefore, better validity of inferences on Russian regions in transition. In particular, the events after the financial crisis of August 1998 could be traced. We discovered a non-linear relationship between income and homicide. In the poorest Republic of Tuva characterised by outlying violent mortality, higher income resulted in lower homicide. For the rest of Russian regions, higher income was associated with higher homicide rates.

These findings are not unique. Deaton (2001) observed a similar non-linear association of income and mortality using data from the National Longitudinal Mortality Survey in the USA. He demonstrated that a much bigger impact on health can be achieved at lower levels of income. At higher levels, income does not result in significant health improvement. The author argues that the nonlinear nature of this income effect may explain why income is less important to health in rich countries.

We assumed that the variable characterising income in our setting should not be understood as a pure expression of absolute material wealth resulting from legal economic activities:

- Higher aggregate-level income may reflect a higher proportion of working population involved in risky occupations. Tyldum et al (2003 p48) reported that “the best jobs are high-risk jobs”. Better earnings result from risky occupations. For the majority of their respondents, the immediate security of having a well-paid job was more important than the potentially hazardous effects on health.

- Aggregate-level income is likely to be confounded by growing economic inequality of the population – which may be termed in the given context as a process of marginalisation, since the share of those who are at the very bottom of the social hierarchy considerably expands. In a formerly egalitarian society, a high degree of economic and social polarisation can result in increasing social tension and higher levels of psychosocial stress.

- Official income by regions may be treated in Russian transitional context as one of the “wild capitalism’s” markers. “Wild capitalism” can be defined as a rapid development of business activities associated with a strenuous fight for the influence spheres in the new “self-regulating” markets – under conditions of weak social protection.

- Both the poorest marginalised people and the relatively wealthy working population do have risks and stress factors related to the “wild capitalism”. For the poorest ones, “wild capitalism” means the absence of any reliable social protection. For the working population, this implies lacking legal regulations of labour and income security.
DISCUSSION

• We suppose that aggregate-level income reflects the extent of these problems for the both population strata in all regions analysed – except for the "less developed" Republic of Tuva, which population is probably still living in the pre-capitalistic economy. Another explanation is that the income distribution in Tuva may follow another pattern than in the rest of Russia’s regions (homogeneous unrelieved poverty).

In order to explore these assumptions, we need additional information on possible confounders or effect modifiers – e.g., patterns of material wealth distribution, reliability of social protection system etc. In the absence of these indicators, we can not test their impact. We can, however, formulate some hypotheses for the future research activities in this field – for instance, the following:

– In the course of the socioeconomic transition, higher official income level is associated with higher risks related to non-shadow economic activities.

– These risks can theoretically be mitigated through functioning legal regulations of labour security and through a reliable system of social protection.

6.3 Addressing the impact of poor socioeconomic environment on mortality: Towards a differentiated approach?

Modern epidemiologists unanimously agree that socioeconomic status is a profound predictor of health (Rothman & Greenland 1998 p575). At the level of populations, the core question persists throughout the last two centuries – about the relationship between material prosperity and population health (Szreter 2003).

In addressing this issue the research work of MH Brenner plays an outstanding role. In his seminal Lancet paper Brenner (1979) hypothesised that “economic instability and insecurity increase the likelihood of immoderate and unstable life habits, disruption of basic social networks, and major life stresses”. Stress and skill obsolescence resulting from economic instability were assumed to be the key factors that disproportionately affect lower socioeconomic groups and inhibit their ability to cope with changes in their economic environment. “In other words, the relative lack of financial and employment security of lower socioeconomic groups is a major source of their higher mortality rates”.

Brenner identified the key pathways through which economic instability and unemployment in particular can lead to elevated mortality. These pathways operate mostly through an increased stress burden and “downward mobility” of people who find themselves out of work. At the individual level, loss of permanent income and work status leads to substantial psychological distress in both unemployed persons and in those who are economically and emotionally dependent of them. At the level of geographic areas, high unemployment may force the population to out-migration, leading thereby to a serious damage of the regional economy over the long term. Therefore, “hard times” may leave deep traces both in the population’s health and in the regional economy.

Brenner stresses that economic changes of recessional or structural nature are first of all detrimental to the employment status of people with inadequate human capital. Semi-skilled and unskilled workers are more likely to loose their jobs at the start of recessions. They are often the last to find a new employment when the economy recovers. The impact of economic fluctuations on health has been examined for the United States over the period 1901-2000 (Brenner 2005). It has been found that the volatility of rapid economic growth – as GDP per capita departs from its major trend – has a very short-term effect to increase mortality. This paradox – referred to as a “creative destruction” (Schumpeter 1975 p82-85) – can be explained by “growing pains” of organisational
adjustment – i.e. adaptation to new technology and the adjustment of the formerly unemployed to new jobs, social status, and organizational structures.

By means of the time-series analysis Brenner found economic recessions to be consistently associated with deteriorating health in wealthy industrialised countries – e.g., in the USA, England and Wales, Sweden and in Western Germany (1973; 1975; 1979; 1987; 1995 pp211–246). The long-term economic growth has been shown to be the central factor in mortality rate decline in the US over the 20th century (2005).

As for the countries experiencing the socioeconomic transition, Brenner's time series models (2003) performed for the Russian Federation, Hungary and Poland provide strong evidence of close relationships between the overall state of the national economy and the cardiovascular and total mortality. Therefore, Brenner's macro level findings confirm the individual-level evidence of close links existing between the socioeconomic status and health outcomes.

Our primary intent was not to replicate Brenner's findings with the Russian regional panel data. We do not treat the relationships between the overall state of the national (regional) economy and mortality as a hypothesis. Rather, we believe that Brenner's evidence is a “law of nature”.

We would like to make another step further and to explore a specific “socioeconomic aetiology” for the selected types of fatal deviant behaviour outcomes. That is, we are primarily interested in concrete constellations of the socioeconomic determinants of mortality in the “best fitting” explanatory models. Consequently, our approach to the development of econometric models has been essentially based on two criteria:

- First, the nature of the particular violent and alcohol-related behaviour outcomes has been thoroughly scrutinized and “crystallized” in detailed hypotheses (Chapters 3 & 4). These hypotheses stipulated the existence of differences and commonalities in the sets of explanatory variables, following from the apparent nature of the phenomena analysed.
- Second, the ultimate parameter selection in the econometric modelling has been jointly determined by the goodness-of-fit and statistical significance of explanatory variables.

The “best fitting” models for both of the stress-related causes of death – suicide and homicide – have good adjusted R-squared values, explaining more than 75 percent of the variation in mortality levels across regions and time.

The explanatory power of the alcohol poisoning models is somewhat weaker – adjusted R-squared is 0.45-0.51, depending on the model type (fixed vs. random effects). A major limitation of this model is an omitted variable bias which is probably related to the lack of data on availability and prices of alcohol and its surrogates, an important block to our conceptual scheme (Scheme 4-1, Chapter 4).

6.4 Suicide

6.4.1 Economic “survival strategies” (coping)

The most remarkable finding was that economic passivity of the regional populations turned out to be the strongest predictor of higher suicide mortality rates. Vice versa, high (complementary) economic activities can be seen as the strongest protective factor against suicide mortality in Russian regions.

Complementary economic activities represented an active problem-oriented coping with economic hardship over the transition period. In the literature, they are discussed as the most suc-
cessful survival strategies of the Russian population in unstable and insecure economic environment (Lokshin & Yemtsov 2001; Gerry & Li 2004).

Complementary economic activities have been often reported by the respondents of the Russian Longitudinal Monitoring Survey. According to Lokshin & Yemtsov (2001), almost one third of the households tried to generate more income via increasing production of agricultural plots (20%), renting out apartments (1%) and finding supplementary jobs (circa 7%) in 1996-1998. Since odd jobs and shadow earnings are likely to be underreported in surveys, the real extent of these coping activities can be considerably underestimated.

Both in cross-sectional and longitudinal designs, in different age groups and national settings, active problem-oriented coping styles have been significantly related to better mental health and increased overall adjustment. This evidence has been repeatedly observed for various types of stressful life events and situations.

In particular, this has been shown for patients with chronic somatic diseases (Felton et al 1984; Parker et al 1988; McCracken et al 1995; Dobkin et al 1999; Kozora et al 2005). In adolescents, active coping styles have been significantly associated with reduction of emotional and behavioural problems, like aggression and delinquency, anxiety and depression, somatic complaints and poor school performance (Gonzales et al 2001; Liu et al 2004). In young adults without severe chronic conditions (a sample of law students), passive coping tactics predicted poorer physical and psychological health in a longitudinal panel study (Pritchard & McIntosh 2003).

Above, we cited the evidence of individual-level associations between passive coping styles and a high suicide risk (Orobch et al 1990; Pollock & Williams 2004).

Lacking economic activity may indicate poor coping styles of the regional populations in transitional Russia. However, since we do not have enough evidence to justify it, an excessive “psychologisation” of economic activity would not be the right thing to do. This would lead to an erroneous policy message.

Rather, there should be solid economic reasons that hamper the regional population’s capacity to improve declining living standards via legal and shadow business activities. These reasons include low real purchasing capacity of the population, poor trade infrastructure, severe climate requiring higher investments etc. Behavioural patterns of “escape” – which are assumed to be crucial for suicide manifestation – can be more common under such circumstances.

6.4.2 “Insane” social environment

In the rating of the relative importance, factor of “passive coping” is followed by social disruption (crime) and heavy binge drinking (alcohol). These findings fit with a variety of quantitative and qualitative evidence from other studies. From the standpoint of psychosocial theory, these phenomena can be considered to be very close – taken together, they indicate an “insane” social environment (Cassel 1976). Therefore, these associations appear to be very plausible.

6.4.2.1 Social disruption (crime)

Anomie and crime in particular have been widely discussed as factors which have a potential to increase suicide rates (Durkheim 1897; Boor & Bair 1990; VanderVoort 2005; Christoffersen et al 2003). Crime – not necessarily violent – has been hypothesised to act as an amplifier of aggressive or auto-aggressive impulses (Plutchik & van Praag 1990).

---

26 as indicated by the absolute values of elasticities at medians (except for rc_dum, which is measured at mean value)
The results of some recent individual-level studies suggest that relationships between crime and suicidal behaviour may be mediated by the sense of coherence. A direct victimisation can potentially decrease an individual's sense of coherence (Koposov et al. 2003) and thereby reduce effective coping. Violence expectation thrust by mass media may probably have similar impact on the sense of coherence.

This, in turn, may result in increased probability of suicidal outcomes. Edwards and Holden (2001) examined suicide ideation, prior suicide attempts, and self-reported likelihood of future suicidal behaviour in a sample of 298 university undergraduates. In female respondents, the interaction of sense of coherence and emotion-oriented coping made a unique, significant contribution to the statistical prediction of all suicide variables. For men, the interaction between sense of coherence and emotion-oriented coping contributed significantly to the statistical prediction of suicide ideation.

### 6.4.2.2 Heavy binge drinking

Alcohol abuse and dependence are important risk factors for committing completed suicide (Waern 2003; Miller et al. 1991). At the aggregate level, suicide mortality was significantly associated with levels of alcohol consumption and heavy binge drinking (Wasserman et al. 1994; Mäkelä 1996; Lester 2001).

Some authors argue that “there is no real inner relatedness between criminality and completed suicide, even though both behaviours can sometimes occur together, e.g. in connection with alcoholism” (Modestin 1986).

There were attempts to identify this “real inner relatedness” in terms of single nosological entities or specific personality attributes – e.g. by assessing associations of conviction records and clinical variables like “anxiety” or “endogeneity” (Modestin et al. 2002). We, however, believe the nature of these relationships to be somewhat more complex than a “simple diagnosis”.

In other words, the “insane” social environment – like an unendurable psychological pain – is a diagnosis-unspecific phenomenon; the underlying mental conditions can not be attributed to a single diagnostic category.

### 6.4.3 Core transition-related stressors

The group of factors which reflect “insane” social environment is followed by the core transition-related stressors. Sorted in descending order of the relative importance, they include:

- hardship of climatic conditions ($rc_{dum}$),
- two factors related to regional economic structure and performance which are assumed to characterise the background for economic passivity and to signify
  - “rural effects” – the preponderance of agricultural sphere (higher per capita volume of agricultural production $lagrC$) and
  - the presence of economic depression in industrialised areas (lower per capita volume of industrial production $loppC$);
- financial losses of the population ($lsav$ – discussed above) and, finally
- Consumer Price Index denoting hyperinflation ($lncpi$).
6.4.3.1 Hardship of climatic conditions

The hypothesis of climate effects has been suggested to explain the spatial distribution of suicide. Higher suicide mortality has been recorded in the northernmost areas of the USA (US Department of Health and Human Services 2003) and in the southernmost provinces of Argentina (Lawrynowicz & Baker 2005). The European countries highest in suicide rate constitute a contiguous, J-shaped belt, spanning from Finland to Austria (Voracek et al 2003).

The majority of scholars assess the impact of climate in terms of latitude and longitude (Davis & Lowell 2002; Lester & Shephard 1998) – in a hope that such measures should be sufficient to describe seasonal variations of light and dark, air humidity, temperatures amplitudes, or threat of natural disasters. No wonder that suicide mortality differences remain largely unexplained for some countries at the same latitudes. The observation of higher suicide rates in Hungary than in England and Finland than in Sweden led to hypotheses of ethnic or even genetic predispositions to suicide among the Finno-Ugrians (Kondrichin 1995).

In our paper, the assessment of regional climatic conditions was based on an integral valuation of more than 30 climatic parameters (Prokhorov 1996 p72; Prokhorov 1998 p312). We consider this measurement to be exacter than latitude and longitude. The impact of climate on mortality has been controlled for the areas’ socioeconomic conditions and partly for the ethnic composition of the regional populations (mostem).

The evidence of a statistically significant association between suicide rates and hardship of climatic conditions serves probably as an argument for a causal link between climate and suicide. A possible neurophysiologic explanation for the suicide-climate link – regarding sunlight exposure – is the recent discovery of retinal melanopsin receptors directly linked to the circadian rhythm centre in the suprachiasmatic nucleus in the brain (Ruby et al 2002). In a multivariate model for Italian towns, sunlight exposure offered the most significant protective contribution among the climatic parameters, when regressed on suicide rates (Preti 1998).

6.4.3.2 “Rural effects”

Rural areas of Russia exhibit higher suicide mortality rates. “Rural effects” – i.e. positive associations between suicide rates and the volume of agricultural production – remain significant even after adjustment for the socioeconomic area characteristics, ethnic composition of the regional population and drinking habits.

In order to understand and explain the “rural phenomenon”, which is typical not only for Russia, numerous studies have been conducted. For instance, Malmberg and colleagues (1997) examined suicide mortality among farmers in comparison with that of the general population of England and Wales. Nishimura and co-authors (2004) investigated the relationship between occupation and suicide in 47 Japanese prefectures and found a significant association of suicide rates with primary industry percentage.

In general, results from these studies suggest that the risk of completed suicide is elevated among farmers and employees in agriculture. Loneliness/isolation, seasonal stress, easy access to dangerous compounds (pesticides etc) and firearms are likely to contribute to suicide behaviour (Pickett et al 1998; Koskinen et al 2002). In this regard, the major limitation of our study is that the direct impact of the above mentioned risk factors could not be investigated.

6.4.3.3 Manufacturing crisis / Hidden unemployment

In our regional settings, suicide rates were inversely related to the per capita volume of industrial production. These relationships are likely to reflect both the effects of transition-related economic
crisis in general and the hidden unemployment in particular. The former priority branches of manufacturing – especially heavy industry – have been hit very hard by this crisis.

Macroeconomic disturbances led to a severe stress experienced by the population – first of all due to explicit and hidden unemployment, arrears of wages, general instability of financial situation, material deprivation and “unclaimed” human capital of qualified employees in crisis-affected branches.

The adjustment for some of these stressors – captured by the numbers of unemployed per one vacancy, hyperinflation reflected by the Consumer Price Index and financial losses measured inversely as private savings per capita – did not eliminate the statistically significant effect of the manufacturing crisis / hidden unemployment.

6.4.3.4 Hyperinflation

The hyperinflation itself has been found to increase suicide rates. This association confirms an independent, psychologically distressing role of hyperinflation, since its material effects are taken into account in our study with the inflation-adjusted per capita savings.

In general, the relationships between suicide and inflation are not yet properly examined in the epidemiological literature. Only one relevant citation has been identified via the National Library of Medicine\textsuperscript{27}. Yang and Lester (1999) have predicted the American suicide rates for 1958-1992 with a “misery index”, which is calculated as the unemployment rate added to the inflation rate. This index is assumed to measure the “amount of misery” felt by ordinary people due to inflation and unemployment.

Intrinsically, our finding fits with Brenner’s (1983) observations. They are also close to the results of a cross-sectional analysis presented by Otsu et al (2004) for all 47 Japanese prefectures, in which male suicide mortality was inversely related to the “economic development factor”.

6.4.4 Stress moderators

The last group of suicide predictors includes two variables described within the rubric of “classical determinants” of mortality or “stress moderators” (Chapter 3, Table 3-2,B). As indicated by the absolute values of elasticities at medians, these variables demonstrate the weakest – but still significant – impact on suicide rates:

- ethnic composition of the regional populations (\textit{moslem}) and
- numbers of unemployed per one vacancy – “chances to get employed” (\textit{uppp}).

6.4.4.1 Ethnic composition of the regional populations

We used the variable \textit{moslem} to describe better patterns of social cohesion/support in definite ethnic groups, namely those with Moslem, Caucasian or Jewish background. Apart from negative attitudes to binge drinking and drunkenness, these ethnic groups are characterised by better solidarity within households and neighbourhoods. In the patriarchal cultures of North Caucasus, people are more likely to live in multi-generation families and to have clearly defined, traditional social roles. The stability of relationships helps to overcome financial difficulties. Family members going off in search of living remain connected with the core households with strong bonds.

In a study of suicides in the former Soviet Union republics, Varnik & Wasserman (1992) denoted the lowest mortality rates in the regions with long-standing traditional lifestyles, strong religious faith and multi-generation families (the Caucasus).

\textsuperscript{27} Requested for suicide [title or abstract] AND inflation [Medical Subject Headings], 30 July 2005
DISCUSSION

Culture-specific patterns of social cohesion/support and their relationships with suicide behaviour have also been examined in other countries. It has been found that African-Americans – regardless of socioeconomic status – demonstrated in the past lower suicide rates than other ethnic groups in the United States (Bingham et al 1994; Willis et al 2002). Some cultural African-American characteristics – like high levels of religiosity and collectivism – have been supposed to serve as protection against suicide (Shaffer et al 1994). Marion and Range (2003) identified three strongest significant suicide buffers in African-American college women: family support, a view that suicide is unacceptable, and a collaborative religious problem-solving style.

We observed an inverse association between suicide mortality and the proportion of specified ethnic groups in the regions of the Russian Federation. These results are controlled for socioeconomic area characteristics and drinking habits. Therefore, the importance of social cohesion/support for suicide prevention has been indirectly supported.

Some limitations should be mentioned, concerning accuracy of measurement. Since there were no annual data on ethnic composition of the population, a time-invariant variable has been calculated. It describes the ethnic structure of regions in 1989 – i.e. at the time of the last Soviet Union population census. The recent migration processes could change the ethnic composition of the regional populations. The association observed would probably be stronger, if exactly measured.

6.4.4.2 “Chances to get employed”

Our findings reveal a significant impact of official unemployment on suicide mortality, non-confounded by the socioeconomic area characteristics and binge drinking habits; the lower the “chances to get employed”, the higher the suicide rates.

This observation is intrinsically consistent with the evidence from recent individual-level longitudinal studies (Lewis & Sloggett 1998; Kposowa 2001; Blakely et al 2003), which discovered an excess suicide risk among the unemployed, controlled for socioeconomic variables. A substantial number of modern and “classic” aggregate-level studies confirm a clear positive and significant relation between unemployment and suicide rates (Brenner 1973; 1983; 1987; Norström 1988; Gunnell et al 1999; Yamasaki 2004).

Other researchers argue that the “effect on suicide rate of having reduced unemployment is uncertain” (Mäkinen 1999). However, such conclusions are usually drawn from ecological studies which suffer from serious methodological limitations – either they are based on a purely cross-sectional approach (Mäkinen 1997), or the associations between suicide rates and unemployment were not properly controlled for other important socioeconomic and demographic variables (Isacsson 2000).

Crawford & Prince (1999) analysed changes in aggregate levels of unemployment, poverty, marriage and the proportion of adults living alone in relation to age-adjusted male suicide rates between 1981 and 1991 in 364 county districts of England. In the one-way ANOVA and multiple linear regression analysis, increased rates of suicide were found to be associated with decreasing unemployment. The proportion of variance explained for the dependent variable was only 13 percent. Obviously, some important aggregate-level suicide predictors were missing in this model, as indicated by the low explanatory power of the model. This was probably the main reason of the “unusual” direction of relationships between suicide and unemployment in this study.

In our analysis, “chances to get employed” have been approximated by the numbers of officially registered unemployed persons per one vacant position (uppp). The major limitation of this proxy measure relates to its inability to exactly mirror the labour market situation. The official figures of the State Employment Services do not include cases of “hidden unemployment” or “disillusioned unemployed” which stopped looking for jobs. However, the general impression on the extent and dynamics of unregistered unemployment can be given by the per capita volume of industrial pro-
DISCUSSION

duction (loppC). Therefore, we hope that the effects of unemployment on suicide are smoothly considered in our study.

6.5 Homicide

The contemporary understanding of violent death assumes some kind of a common link or connection between suicide and homicide (Bills & Li 2005). This idea goes back to at least the early 1800s. Guerry (1833) considered the act of killing oneself and the crime of killing another person as comparable phenomena. Tissot (1840) provided little differentiation between the acts of homicide and suicide and stated that the both violent outcomes share a common aetiology (abnormal behaviour), result (death) and method (by one’s own hands or by another’s).

Henry and Short (1954) believed that homicide and suicide are causally related and mediated by the levels of societal restraint over an individual's actions. Less restraint – more freedom – results in increased suicide and decreased homicide. More control would lead to high homicide and low suicide. The authors concluded that both types of violent behaviour are “aggressive acts which respond in a consistent way to objective frustrations generated by the flow of economic forces” (Henry & Short 1954 p14). Their arguments are an extension of Freud's thesis of a “homicidal drive” induced either by an individual's sexual frustration or death instinct that may turn toward oneself in form of suicidal impulses.

Studies of victim-offender relationships (Hentig 1948; Wolfgang 1958) provided some evidence that many homicides are “victim-precipitated” – therefore, they represent suicides. From this perspective, suicide and homicide can be viewed as complementary phenomena, in which self-destruction is discharged in two psychologically similar, socially distinct Gestalten. Holinger (1980; 1982) identified similar patterns of homicide and suicide in the United States across time.

Unnithan and colleagues (1994) suggested that suicide and homicide are “two alternative channels in a single stream of lethal violence.” There are two sets of causal mechanisms that determine suicide and homicide mortality – namely, forces of production and forces of direction. Forces of production refer to social and cultural factors that are responsible for the total amount of lethal violence. Forces of direction refer to cultural and structural factors that prompt members of society to direct their violent drives to either suicide or homicide. A higher tendency of external blame will result in a higher homicide rate relative to suicide rate. Conversely, factors that increase the likelihood of internal attribution of blame increase the risk of suicide relative to homicide.

Recent studies provided some moderate support for the stream analogy proposed by Unnithan et al. Batton (1999) examined homicide and suicide trends in the USA and found that rates of alcohol consumption, immigration and divorce were related to external attribution of blame and higher homicide rates. With a cross-sectional approach, Wu (2003) studied regional homicide and suicide rates for the USA and discovered that counties with a higher proportion of non-white residents tend to express lethal violence as homicide. Other important characteristics of regions that express lethal violence in the form of homicide include: higher unemployment rates, higher income inequality (Gini index), southern counties, larger counties, and higher degree of racial segregation.

In general, the papers cited treat suicide and homicide as close phenomena which may share common causes. The most developed theory explaining patterns of human violence is the stream analogy of Unnithan et al. It gives a promising tool to study the common determinants of these violent outcomes. However, it does not provide an adequate basis for understanding differences in the spatial distribution of suicide and homicide.
In principle, our psychosocial stress model does not contradict the stream analogy. Rather, it may be seen as a refinement, since it offers a more differentiated approach to identifying the "forces of direction" in a given population. In our view, these "forces of direction" are determined by the stage of stress. Non-premeditated homicide is assumed to manifest in the Alarm stage, whereas non-impulsive suicide is causally linked with Exhaustion. Therefore, these "forces of direction" can be measured as markers of specific behavioural patterns in Alarm or Exhaustion – e.g. "excessive risks" or "passivity", respectively.

Consequently, suicide and homicide should not necessarily represent the “alternative channels” of violence. Both patterns of behaviour can sometimes be observed in the same individuals. Some forensic studies report strong associations between charges of murder or manslaughter and suicide deaths (Haynes & Marques 1984). In England and Wales (1988-1992), 0.8% of male and 0.4% of female suicide deaths occurred in homicide-suicide incidents, mostly as a “family matter” – men of predominantly lower social class killed their kin, and pre-menopausal mothers their young children, before they committed suicide (Barraclough & Harris 2002).

We started to model stress-related violent mortality with the same set of explanatory variables, and we aimed at a combination of parameters which would fulfil the criteria of the “best fitting” model with all variables significant at the 5% level. Finally, it turned out that the final “best fitting” explanatory models for suicide and homicide contain some common predictors. However, there are also differences.

Let us begin with the discussion of similarities.

6.5.1 Economic “survival strategies” (coping)

We observed that higher levels of (complementary) economic activities (accountd) of the regional populations were associated with decreased homicide mortality. Very similar evidence has been demonstrated for suicide mortality. For homicide death rates, accountd occupies the third place in the ranking of the relative importance of explanatory variables.

Active problem-solving coping strategies – in our settings, complementary economic activities protecting households from impoverishment – significantly reduce stress-related mortality outcomes. These results take into account aggregate-level effects of education, as well as material wealth of the regional populations prior to the beginning of economic reforms. The importance of these potential confounders has been demonstrated by Lokshin & Yemtsov (2001) and Tchernina (1996): the authors found that wealthier households and respondents with higher levels of education are more likely to implement active coping strategies.

The novelty of our study is that we used an uncommon measure to approximate the development and level of complementary economic activities in the Russian regional populations – i.e. number of private deposit accounts per capita (account) or its dichotomised equivalent (accountd). This measurement approach is based on some peculiarities of Russian banking system, in which private SBERBANK accounts have the form of purpose-oriented deposits – wage or pension deposits etc. Therefore, economically active persons with multiple working places or odd jobs – both in the shadow and legal economy – are more likely to hold multiple deposit accounts.

Surely, the applied measurement approach is not free of limitations. First, it may not work in other national settings, with banks providing multipurpose accounts for the population. In other words, its external validity may be weak. Second, in Russia, the number of private SBERBANK accounts per capita does not reflect the full extent of complementary economic activities. In many cases, earnings from these activities are placed beyond the bounds of SBERBANK. Despite all limitations, we believe that the applied measurement approach has no alternative for our study population within the time span analysed.
6.5.2 “Insane” social environment

In the explanatory model of homicide mortality, there is the same group of factors related to “insane” social environment. Social tension/disruption (crime) and heavy binge drinking (alcp) bring about increasing homicide mortality. These regressors have superior positions in the ranking of their relative importance\(^28\) – second place is occupied by crime and fourth – by alcp.

Further, the effects of social tension/disruption and heavy binge drinking do not show statistically significant differences in magnitude across models, as indicated by the overlapping confidence intervals for the elasticities estimated at the same values of variables crime and alcp (see Table 5-10: comparison of elasticities obtained for the common explanatory variables in the GLS random effects models of suicide and homicide mortality). As for heavy binge drinking, the elasticity values are very close for suicide and homicide: 0.153 and 0.156, respectively.

6.5.2.1 Social tension/disruption (crime)

A large body of research exists on links between homicide and crime. Individual-level studies reveal typically an increased prevalence of previous criminal records in homicide offenders (Wolfgang 1958; Straus 1986; Braga 2003; Cook et al 2005; Hakkanen 2005). In the USA, most cases of homicide are preceded by a history of assaults (Mercy & Saltzman 1989; Campbell et al 2003). In a sample of 36 nations, homicide rates have been found to be positively associated with a “violent crime index” (Lester 2003). Andrienko (2001) approximated “criminal experience” by lagged crime rates and found a positive significant association with homicide rates in a panel data analysis of Russian regions. These findings are fairly similar to our results.

From the standpoint of cognitive theories, these links can be explained by the factors related to information processing, i.e., imitative learning of socially permissible forms of behaviour. Imitation and conformity are central to our dependency on a learned way of life (Wilkinson 2004). In other words, if aggression and some forms of criminal behaviour are regarded to be “permissible” in a given population, they will be more common there. In individuals, repeated crime and violence exposure – e.g., participation in criminal violent acts, crime witnessing and violence victimisation – may increase the likelihood of an aggressive, violent stress response (Hardwick & Rowton-lee 1996).

In wealthy societies, these experiences are more prevalent in members of socially and economically disadvantaged population groups. Therefore, many researchers believe that inequality – income, gender, racial or whatever – is socially corrosive and brings about more violence (Hawkins 1993; Scheper-Hughes 2004; Wilkinson 2004; Schwartz 2005; Pickett et al 2005). “The invisible social machinery of inequality reproduces social relations of exclusion and marginalization via ideologies, stigmas, and dangerous discourses attendant to race, class, sex, and other invidious distinctions” (Scheper-Hughes 2004). Daly and co-authors (2001) observed a positive and strong linear association between income inequality and homicide levels in the USA and Canadian provinces.

How does inequality within a population result in increased violence levels? The exact pathways are not yet clear. Richard Wilkinson (2004) suggests that low social status and related subordinate position in dominance hierarchies is detrimental for health in general and crucial for the manifestation of aggression and violence. The effects of low social status are mediated by stress.

In witness of these effects, Wilkinson refers to the evidence from experiments with non-human primates, in which social status has been manipulated, whereas food and other material conditions were held equal (Shively & Clarkson 1994). Animals were moved between groups – subordinates became dominant and dominants became subordinate. All animals that changed social

\(^{28}\) as indicated by the absolute values of elasticities at medians
positions had worsened health, whether they became dominant or subordinate. Subordinates that became dominant had 44% more coronary artery atherosclerosis than their counterparts that did not change social status. Even more powerful health effects were observed in dominants that became subordinate – they had 500% more atherosclerosis, as compared to those with non-altered status.

This evidence suggests, however, that any major status alteration can potentially be dangerous for health, and not just the very fact of low social status. Both in humans and animals, such conditions can be perceived as a “resource challenge” (Blanchard & Blanchard 2003) – i.e. a situation of potentially threatening and, therefore, stressful nature.

In the context of “resource challenge”, offensive aggressive behaviour can represent an adaptive stress response (Blanchard et al 1999 p297–316), since it stands for an attempt to control resources. In animals, such control may be exerted through dominance hierarchy relationships or territoriality, with dominants or territory holders having enhanced access to crucial resources. These two conditions are sometimes combined, with colonial mammals also attacking intruders into their territory as a group – e.g., hamadryas baboons (Kummer 1995).

Offensive aggression in humans is often based on the same motives as in animals – namely, the need to control and impress others, or to improve one’s position in dominance relationships (Averill 1982; Bond et al 1997; Blanchard & Blanchard 2003). More specific support for this view may be found in analyses of the outcomes of (successful) aggression, that status and access to status symbols such as “trophy” women may be more important than the specific material goods gained by violence, and that these status considerations constitute an important part of the subjective rewards of winning (Katz 1988; Daly & Wilson 1988).

Therefore, summarising the discussions about inequality and violence, we conclude that an insecure social status in an unequal society is likely to be associated with elevated stress levels. Stress emerges due to the ancient mechanisms of “resource challenge” which can result in an increased risk of aggression and violence. The fact that violent crimes and homicides are mostly committed by young men with a low socioeconomic status may probably testify to their increased vulnerability to this particular type of stress – or their barest necessity to improve their social status.

In this respect, our study has a serious limitation, since our results are not adjusted for the effects of inequality. Crime rates are used to measure the levels of “social tension/disruption”, which are known to be higher in the countries with larger income inequalities (Uslander 2002; Wilkinson 2004). Therefore, the relationships between crime and homicide mortality are confounded by the impact of income inequality.

### 6.5.2.2 Heavy binge drinking

The detrimental role of alcohol with respect to violence and homicides in particular has been repeatedly documented both in criminological and epidemiological studies. According to Wolfgang (1958), in two-thirds of the cases, the victim, the offender, or both, had been drinking alcohol prior to the event.

Wells and colleagues (2003; 2005) suggested that higher level of intoxication – not just drinking by itself – and drinking more often and in greater amounts are risk factors for the escalation of violence. Quicker and deeper intoxication results from binge drinking and distilled spirits – this has been shown to be associated with assault and homicide for Sweden (Norström 1998).

Pridemore (2004) reported that deaths from alcohol poisoning and homicide occur more frequently during the weekends compared to weekdays, and that the daily distributions of alcohol poisoning mortality (a proxy for binge drinking) and homicide mortality co-vary in a Russian in-
industrial region. In Slovenia, increased blood levels of alcohol were strongly related to violent
deaths, including those from homicide (Skibin et al 2005). Thus, our findings of close associations
between heavy binge drinking and homicide are consistent with the results from previous re-
search.

It should be mentioned here that heavy binge drinking is an important, but not the leading pre-
dictor of suicide and homicide mortality, as follows from our panel data analysis. Further, a pure
impact of heavy binge drinking – non-confounded by income polarisation or the overall mental
state of the Russian regional populations – could not be analysed in our study. Therefore, the
observed effects of heavy binge drinking are likely to be overestimated.

Finally, it turned out that “heavy binge drinking” and stress-related outcomes have some common
explanatory variables – such as social tension/disruption, mean private savings per capita etc.
This finding requires a further analytical step with a more sophisticated modelling approach –
e.g., simultaneous equations with panel data – in order to explore complex interrelationships
between heavy binge drinking and suicide or homicide mortality. Future work is needed for an
unbiased testing of these associations.

6.5.3 Core transition-related stressors

Let us consider the group of the core transition-related stressors in relation to homicide rates. As
in the model of suicide mortality, this group includes:

- financial losses of the population inversely measured as private savings per capita ($lsav$),
- hardship of climatic conditions ($rc\_dum$) and
- Consumer Price Index denoting hyperinflation ($lncpi$).

In this list, the variables are sorted by their relative importance. The regressors demonstrated the
same direction of relationships with both of the stress-related fatal outcomes. We compared the
strength of their effects on suicide and homicide mortality (Table 5-10). There were no significant
differences in the magnitude of climate effects. However, the impact of financial losses and
hyperinflation on homicide rates was significantly stronger.

How can these differences be explained? Probably, severe climate represents a “chronic
stressor” in the regions, whereas financial losses and hyperinflation had an extremely acute char-
acter. Non-premeditated homicide is assumed to manifest in the Alarm stage of stress – there-
fore, it should be more “reactive” than non-impulsive suicide in relation to acute stressors.

There are, however, some important differences between the “best fitting” models of the behav-
ioural stress outcomes, concerning the group of the core transition-related stressors. Thus, for
homicide mortality, we could clearly distinguish the detrimental effects of the “wild capitalism
markers” – i.e., variables indicating the presence of risks related to:

- legal economic activities ($linc$) and
- complementary economic activities ($accsav$) of the regional populations.

Above, we discoursed upon the issues of legal mean per capita income ($linc$) in relation to homi-
cide mortality rates. Therefore, we will omit the subject of $linc$ in the given subsection.

Finally, there is one more stressor, which was included only in the “best fitting” model of homicide
mortality rates:

- higher costs of living and production in climatically disadvantaged areas, accelerated by
  inflation ($rccpi$).
6.5.3.1 Financial losses of the population

There may be several pathways by which financial losses of the population lead to increasing homicide rates. First, loss of savings is a serious threat to economic security of households and individuals. Therefore, it causes an acute distress among the public (World Bank 2000 p2). Second, loss of savings is an intermediary step to widening economic inequality. In the case of imperfect credit markets, impoverished individuals bereft of their savings can not borrow from a bank against future incomes. Consequently, they can not invest in human capital – e.g., better education and professional re-training for a successful adaptation to changing labour market conditions (Thorbecke & Charumilind 2002). Unequal educational opportunities – or, better expressed, unequal adjustment to new economic and labour market conditions – aggravate the existing relative deprivation and contribute to widening economic inequalities. The effects of inequalities have been widely discussed in the literature in relation to any violent crime, including homicide (Kelly 2000; Wilkinson 2004).

As Kelly points out:

“Strain theory argues that, when faced with the relative success of others around them, unsuccessful individuals feel frustration with their situation: The greater the inequality, the higher this strain, and the greater the inducement for low-status individuals to commit crime. Social disorganization theory argues that crime occurs when the mechanisms of social control are weakened. Factors that weaken a community's ability to regulate its members are poverty, racial heterogeneity, residential mobility, and family instability. In this case, inequality is associated with crime because it is linked to poverty-areas where high inequality tends to have high poverty rates.”

Since we could not control for inequalities in our study, we are unable to determine the magnitude of their impact on homicide mortality rates in the Russian regions. We assume, however, that stress is the most powerful determinant of homicide mortality within the time span analysed – whether it directly results from acute financial losses or from a “resource challenge” of growing income inequalities, or both. The rapid unanticipated changes of the socioeconomic situation caused an enormous strain of adaptational resources of the Russian population.

6.5.3.2 Hardship of climatic conditions

All in all, the links between climatic parameters and homicide mortality rates are not yet properly investigated. For the United States, Lester & Shephard (1998) observed a gradual variation of homicide rates with latitude. This north-south variation can, however, be explained by other – more essential – variables, which were not taken into account, such as income inequalities etc.

In a panel data analysis of Russian regions (Andrienko 2001), the results were controlled for the effects of “crime experience” and “police strength”, as well as for the set of socio-economic and demographic characteristics of regional areas. Despite this adjustment, the impact of longitude and latitude on homicide rates remained significant, indicating a clear west-east and south-north gradient of violent mortality.

How can these results be interpreted? Do longitude and latitude reflect unobservable inter-regional differences – like rates of household firearm ownership, norms, culture and traditions? Does climate matter?

Maes and colleagues (1994) explored time-relationships of homicide and suicide with a set of weather variables in Belgium. For the period 1979-1987, no association has been found between weekly numbers of homicide and any of the weather parameters – i.e. ambient temperature, relative humidity, air pressure and hours of sunlight, precipitation per day, wind speed and geomag-
nentic index. At the same time, suicide mortality could be significantly explained by some of these variables.

Several studies examined seasonal differences in homicide rates. In colder countries of the Northern hemisphere, higher spring and summer incidence of homicide rates has been observed. In particular, this was reported for Newfoundland (Avis 1996), Oslo and Copenhagen (Hougen et al 1999), and the whole Finland (Tiihonen et al 1997).

There are hypotheses linking impulsive aggression with circannual rhythms of central serotonin neurotransmission. Low concentrations of the major serotonin metabolite – 5-hydroxyindoleacetic acid (5-HIAA) – in the cerebrospinal fluid are known to be related to impulsivity and aggression (Brown & Linnoila 1990; Virkkunen et al 1994). Recent longitudinal studies on the seasonal rhythms of serotonin precursor’s levels have identified the circannual peaks of tryptophan around January and February and the nadirs around May and August (DeMet et al 1989; DeMet et al 1991; Maes et al 1995; Maes et al 1996).

If these hypotheses are correct, we may assume that some of the climatic conditions – for instance, extreme severity or high seasonal variability – act as major stressors for the system of neurotransmission, increasing the likelihood of violent outcomes in the populations of climatically disadvantaged areas. In our study, hardship of climatic conditions was positively related to homicide mortality rates. We attempted to adjust this association for the effects of higher costs of living and production in climatically disadvantaged regions, accelerated by inflation (rccppi). However, we can not exclude other explanations, like firearm ownership rates. Further studies in properly controlled settings are needed to shed the light on these issues.

### 6.5.3.3 Hyperinflation

Several epidemiological papers discuss the detrimental impact of inflation on some selected public health indicators. Rampant inflation has been reported during the periods of severe economic crises. One of them happened in Latin America in 1980s. Health indicators deteriorated in the majority of the continent’s countries, and inflation has been believed to represent one of the most important causal factors (Mena Castro 1991). Systematic studies were, however, impossible because of “inadequacy of most national statistical series”. Later, a Chilean ecological study revealed a positive significant association of inflation and infant mortality between 1985 and 1999 (Szot 2002). During the East Asian economic crisis of 1997-98, a simultaneous sharp increase of inflation and self-reported morbidity has been observed in Indonesia, both in urban and rural areas (Waters et al 2003).

In the criminological literature, there is an assumption that crime and deviance can be explained by lack of access to opportunities and resources (Shaw & McKay 1942; Sampson et al 1997). Since hyperinflation may significantly affect purchasing capacity of households and individuals (Waters et al 2003), restricting thereby access to health care, necessary goods or status symbols, its effects should be taken into account in the explanatory models of homicide mortality. Economic uncertainty caused by a high inflation may play a crucial role per se, acting as a stressor. However, the studies examining inflation in relation to homicide rates are rather uncommon.

The American criminologist Gary LaFree and his colleagues used time-series data from 1957 to 1988 to assess how educational attainment, inflation, unemployment, economic well-being, and family structure affect the rates of black and white crime. The authors utilised Consumer Price Index as a measure of inflation. In white American residents, arrest rates for homicide have been found to significantly increase when inflation goes up, whereas education falls (LaFree et al 1992). For African-Americans, the only significant predictor of homicide arrests was raising income. The results were adjusted for other variables listed above, but not for income inequality.
DISCUSSION

In a longitudinal design over a 68-year period, Kaminsky & Marvell (2002) found that declining inflation – together with the economic growth and “increased prison populations” – appeared to have the largest impact on the reduction of homicide rates for both the police officers and the general public in the USA. The researchers pointed out that the harder the economic times and the greater the economic uncertainty, the higher the murder rates. Following that trend, the highest police homicide rate was in the 1930’s during the Great Depression. In contrast, when the economy was booming in 1998, the rate for police homicides was more than 80 percent lower than in 1930.

The positive significant association of inflation and homicide rates, observed in our panel data analysis of Russian regions, is independent from the effects of dynamically developing material deprivation, heavy binge drinking and other variables included in the model. This evidence is intrinsically consistent with findings from the American criminological studies. We believe that this association deserves more attention in epidemiological studies of stress-related mortality in transitional countries.

6.5.3.4 Risks related to (complementary) economic activities of the population

The interactive term $\text{accsav}$ is a product of mean per capita savings (natural logarithm, $\text{lsav}$) and the dichotomised level of economic activity of the population ($\text{accountd}$). With its help we revealed the differential impact of per capita savings on homicide mortality in two big groups of Russian administrative areas – namely, regions with high versus low level of economic activities.

The introduction of $\text{accsav}$ implicates the following scenario: if private savings would grow, homicide mortality would decrease in all regions. However, this decrease would be less noticeable in the regions with the high level of (complementary) economic activities of the population. The positive sign before $\text{accsav}$ indicates a significant reduction of the protective effect of per capita savings in the regions where the level of economic activities is high – first of all, due to risks associated with these activities.

An alternative scenario assumes the existence of two hypothetical regions with the same level of material wealth, assessable as per capita savings. However, in one of these regions, the population needs to be “more active” to sustain this level. Why such difference? Either these economic activities are less profitable, or the population of this region is less eager to save – perhaps, due to increased investments in the subsequent business activities. Theoretically, homicide mortality rates should be higher in this region, as compared to its counterpart with more “relaxed” and risk-averse population’s attitudes to economic activities. This scenario assumes, of course, that the conditions represented by other variables are identical in both regions.

This approach provided an opportunity to control for risks related to (complementary) economic activities of the population – and to reveal a statistically significant effect of these risks on homicide mortality. These risks are unlikely to be attributed to the effects of inflation, since they have been taken into account in our model.

In Chapter 5, we have already referred to a very illustrative example of such risks, associated with a very popular small-scale shadow business of the 1990s – the so-called “shuttle-traders” (“chelnoki”). This widespread profession dealt with unregistered imports of cheap goods from abroad. “Chelnoki” were confronted with racket, excessive taxes, counterfeit US-dollar bills and many other problems related to an unstable and insecure economic environment.

6.5.3.5 Higher costs of living and production in climatically disadvantaged areas, accelerated by inflation

The present analysis indicated that the impact of inflation on homicide mortality is higher in climatically disadvantaged regions. This has been shown by the positive sign and statistical signifi-
cance of the interactive term \( rccpi \) – a product of Consumer Price Index (\( lncpi \)) and the climate dummy (\( rc_dum \)).

Prior to the beginning of the economic reforms, there were already 10-12 fold differences in living costs between the regions with comfortable and extremely severe climate (Prokhorov 1991 p112).

After the price liberalisation of 1992 and breakdown of the economic relationships, the population of climatically disadvantaged regions experienced an elevated magnitude of inflation (Figure 6-1). Permafrost, extremely cold winter temperatures, lacking insolation and precipitation hamper agricultural activities – especially personal subsidiary plots. Food demand of the population can be covered only through import from more beneficial areas. However, extra food costs are only a minor part of problem. More investments in the social infrastructure, industry, railway and roads system, as well as everyday amenities and health services are necessary (Bush 2005). With other words, cold is expensive, and its costs grew within the time span analysed.

Figure 6-1 Box and whisker graph of means: Consumer Price Index in the regions with beneficial versus severe climatic conditions

Having been adjusted for the effects of other “core transition-related stressors”, the interactive term \( rccpi \) occupies only an inferior position in the ranking of the relative importance (12th place). However, it reveals an additional significant population stress in climatically disadvantaged provinces – produced by arduous living conditions, excessive physical hardship and higher costs, accelerated by the inflation.

6.5.4 Stress moderators

6.5.4.1 Education

Education represents a “classical” determinant of mortality / stress moderator. The pathways by which education may influence patterns of homicide mortality have been outlined in Chapter 3 (subsection 3.5.6 Education).

There is a solid evidence for its protective effects, resulting from studies of violent crime and homicide mortality. Higher aggregate-level education is strongly associated with lower homicide incidence rates (Kawachi et al 1999; Andrienko 2001; Najem et al 2004). Poor education is very
common among homicide offenders and other violent criminals (Madsen et al 2001; Chan et al 2004). In individual-level studies of homicide victimisation, lower educational level has been found to be a significant predictor of violent death among adolescents and young adults (Falbo et al 2001). In employed males, there was a strong trend of higher homicide death rates in lower educational, occupational and income groups (Steenland et al 2003).

For the set of Russian administrative areas, we obtained very similar results – better aggregate-level resources for educational skills improvement (unir) have a significant protective impact on homicide mortality. These findings are controlled for the effects of material wealth, which may determine access to education by regions.

6.5.5 Spatial and temporal variability of homicide mortality rates

Within the time span analysed, homicide mortality rates exhibit an enormous variability in the regions of Russia. In order to statistically explain this heterogeneity, four auxiliary variables were indispensable.

Simple and squared trends – ye1 and ye2 – indicate rising homicide incidence rates after 1998. Probably, the financial crisis of August 1998 spurred up the development of some socioeconomic processes which have not been taken into account in our model (growing inequality?).

A unique case of the “less developed” Republic of Tuva required the regional atypism dummy (atyp). Apart from outlying homicide rates, Tuva differs from the rest of Russia in many respects, and this evidence deserves a special attention of researchers. In particular, the impact of official aggregate-level income on homicide rates differs for Tuva and the rest of Russia (lincatyp).

Tuva’s social sphere is underdeveloped; its economy is dominated by agriculture (animal husbandry, especially breeding of fine-fleeced sheep). The negative factors hindering industrial development include poor infrastructure – lack of railways and weakness of the existing power base. The Republic’s Gross Regional Product is one of the lowest in the country. The same is true for Tuva’s mean per capita income and private savings. With other words, it is one of the most disadvantaged regions of the Russian Federation, with the lowest life expectancy at birth – 56 years for the both sexes (Lagutenko 2001 p167).

6.6 Accidental poisoning by alcohol

In our panel data analysis, higher regional incidence of alcohol poisonings mortality rates was basically determined by two groups of factors:

(1) those related to drinking habits and

(2) those indicating the presence of marginalisation-related processes in the regional societies.

6.6.1 Drinking habits

Drinking habits were characterised by:

- urban / rural settings (urbanisation - urb),
- educational background (education - unir) and
- ethnic groups (ethnic composition of the regional populations - moslem).
6.6.1.1 Urbanisation

Our results suggest: the less urbanised the regions, the higher the level of alcohol poisoning mortality. Low degree of urbanisation (urb) was the strongest predictor of fatal alcohol-related outcomes.

In general, the urban-rural differences in alcohol poisoning mortality have not been properly examined in the epidemiological literature. The findings on the prevalence of alcohol-related disorders – abuse, harmful use and dependence – and heavy binge drinking by types of settlements are conflicting.

Rural residence has been found to represent a risk factor for alcohol dependence in Korea (Lee et al 1990) and in one of the USA settings (Piedmont, North Carolina) examined in the Epidemiologic Catchment Area study (Blazer et al 1985).

In other countries, lower rural prevalence of alcohol-related disorders (abuse and dependence) and “heavy drinking” has been reported. For example, the cross-sectional European Study of the Epidemiology of Mental Disorders (ESEMeD) found lower 12-months and lifetime prevalence of alcohol-related disorders in the rural settings of France (Lepine et al 2005). Similarly, the National Morbidity Survey carried out in Great Britain revealed a significantly lower rural prevalence of alcohol dependence. However, this significance of urban-rural differences disappeared after adjustment for socioeconomic conditions (Paykel et al 2003). Data from the National Longitudinal Alcohol Epidemiologic Study (NLAES) suggested a lower probability of heavy drinking and intoxication among the rural USA residents (Dawson et al 1995).

In Iceland, in a random sample of people born in 1931, alcohol abuse was more prevalent among those living in rural areas. Alcohol dependence was, however, more prevalent in the urban area (Stefansson et al 1991).

As for Russia, our analytical results show the best agreement with the facts. Indeed, rural rates of fatal alcohol poisonings exceed urban ones (Figure 5-17), and the mean surplus of rural mortality is about 6.6 per 100 000 residents in our set of 77 regions.

The negative relationship between the urbanisation degree and fatal alcohol poisonings rates – observed in our models – can not be attributed to the aggregate-level effects of material deprivation (inversely measured by private per capita savings), education, unemployment and the socio-demographic variables, like rates of divorces and abortions.

Are there any reliable studies indicating more dangerous drinking habits among the rural population of Russia? We failed to find any confirmation from survey materials. Bobak and co-authors (1999) reported no significant differences in the overall prevalence of binge drinking “by size of settlement” in a multi-stage random sample of Russian population aged 18 years and over (N=1599). Binge drinking has been measured as consumption of ≥ 25 cl of vodka at one occasion at least once a month.

Cockerham (2000) found that urban residents were significantly more likely to drink frequently than persons from rural areas. These conclusions were based on a cross-sectional study with a representative sample of Russian respondents (N=8402) aged 16 years and over. However, neither types of alcoholic beverages, nor quantity of alcohol drunken at one occasion were taken into account in this survey.

Why do these results contradict to our findings? The key point is that the heaviest drinkers are likely to be underrepresented in surveys, even if sampling procedures provide an “irreproachable” representativeness of respondents with respect to demographical or residential parameters of the target population. An incomparably higher quality of “hard data” that we used guarantees better internal validity and reliability of our findings.
6.6.1.2 Education

Education is considered as a structural determinant of material and cultural resources of individuals and populations. Drinking habits may largely depend on these factors. Numerous studies have shown that people with higher education are significantly less likely to suffer from severe alcohol problems (Blazer et al 1985; Pakriev et al 1998).

At the individual level, education constitutes an important dimension of the socioeconomic status (SES). In a study of alcohol dependence risk, education retained its statistical significance in males even after adjustment for family history of alcoholism and other measures of SES – income and occupation (Curran et al 1999).

The protective role of education has also been documented in studies of alcohol-related mortality. In the USA, lower state levels of male liver cirrhosis death rates were strongly associated with higher aggregate-level education (Singh & Hoyert 2000). Both in Finland (Poikolainen & Vuori 1985) and in the United States (Yoon et al 2003) education was inversely related to the risk of alcohol poisoning death. Similar patterns of associations have been found for the broader categories of alcohol-induced mortality which included “acute” and “chronic” alcohol-related conditions (Mäkelä 1999).

Our analysis indicates that the incidence of alcohol poisoning mortality rates is higher in the regions with lower access to educational resources. These findings are controlled for the effects of material wealth, unemployment and urbanisation. Thus, our study supports the evidence of the important protective role of education, which has never been examined before in Russian regional settings for alcohol poisoning mortality.

6.6.1.3 Ethnic composition of the regional populations

In general, Russia is a “wet” drinking culture with a high societal tolerance of heavy drinking (White 1996) and the preference for distilled spirits (Nemtsov 2000). Russian drinking habits seem to have some genetic basis. Recently, Ogurtsov and colleagues (2001) discovered a substantial difference between the Russian and western European populations, which refers to the enzymatic handling of alcohol. Russians have a high prevalence of a gene for fast activity of alcohol dehydrogenase. This enzyme contributes to a better alcohol tolerance, allowing individuals to drink large quantities but recover from the resulting intoxication relatively quickly, if they survive.

Nemtsov (2005) has carefully reviewed drinking patterns and trends in alcohol consumption in Russia over centuries. Here are some facts.

The consumption of vodka began in the 15th or 16th centuries. However, until the mid-18th century, Russian vodka was never stronger than 20° (Pokhlebkin 1991). In 1474 an edict of Prince Ivan III initiated a tax on vodka, creating a new source of revenue. Ivan IV (the Terrible) introduced the czarist kabaks (lush houses), which became “liquor dens”. Historical descriptions of Russian drunkenness refer basically to events in these “dens”. Since kabaks were found almost exclusively in towns, heavy drinking was a predominantly urban phenomenon (Zhirov & Petrova 1998).

In the 17th century a pail of vodka (12.3 litres) was nearly twice as expensive as a cow. Consequently, the impact of heavy drinking was concentrated within a small section of the population; as late as 1897, the urban population in Russia was a mere 14.5%.

The most important phase in the growth of alcohol consumption began in the 18th century, when Peter I (the Great) removed all restrictions on distillation. This decision was forced by a severe pressure on the state treasury due to military expenditures. The number of kabaks and public revenues from alcohol sales grew rapidly (Zhirov & Petrova 1998).
By the end of the 19th century, the numbers of distilleries increased substantially, and the price of vodka fell. After the abolition of the serfdom (1861), vodka became affordable for the rural poor. According to official figures, alcohol consumption reached 6.2 litres per capita in 1864 (Ostroumov 1914). Actual consumption was somewhat higher due to the illicit production and sale of liquor, although this was subject to serious criminal sanctions. In 1886, the tsarist government initiated the replacement of kабакs by taverns (трактир), where food was offered with alcohol. This measure interrupted the upward trends in alcohol consumption. Despite the rapid industrialisation and urbanisation, the levels of alcohol consumption in Russia were far below those in Western Europe.

A succession of events in the first half of the 20th century kept alcohol consumption under a degree of control. Russia experienced two world wars, a civil war and the Stalinist terrors of the 1930s. The “semi-dry” laws of 1914 and 1918 banned the production and sale of strong alcoholic beverages (Zaigraev 1992). However, since 1950s there was a precipitous growth of alcohol consumption in Russia, reaching 4.5 litres in 1960, 8.2 litres in 1970 and 10.5 litres in 1980 (official GOSKOMSTAT figures cited by Nemtsov 2005). The author believes that the very nature of consumption began to change in 1970s – both in quantity and in quality. Drunkenness became common on work days, often during working hours. Heavy drinking spread to young people and women, among whom it had previously been subject to social disapproval.

After the cancellation of Gorbachev’s anti-alcohol campaign (1985-1987), alcohol consumption returned to its “pre-Gorbachev’s” level by 1991-1992. It continued to grow until 1994; the subsequent decline was followed by a new increase since 1998. By 2001, the total consumption has climbed to 15 litres per capita (Nemtsov 2003). Unlike the situation in the past, consumption in rural areas was even higher, at 17.3 litres in 2002 (Zaigraev 2004 pp211–234). A major factor is the low price of alcohol, much of which is counterfeit and not subject to taxation.

However, heavy binge drinking habits are not uniform in Russia. Some regions – in particular, those of North Caucasus – have markedly different attitudes to alcohol consumption. We assumed a higher prevalence of abstainers in the ethnic groups with Muslim religious background, as well as a “dry” culture in the non-Moslem Caucasian and Jewish populations. Therefore, we introduced the variable moslem to approximate different cultural attitudes to alcohol consumption. It was statistically significant in the random effects model. We observed the lower incidence of alcohol poisoning mortality rates in the regions with a bigger proportion of ethnic groups with Moslem, Caucasian or Jewish background.

These results are in agreement with the findings of Bobak et al (1999). The authors observed the lowest prevalence of heavy drinking in the Volga region29 and North Caucasus. These “geographical differences” were not removed by adjusting for other variables characterising marital and employment status, level of education, as well as material deprivation. Above, we pointed out to the serious limitations of this survey concerning the under-representation of the marginalised heaviest drinkers by urban/rural settings. Nevertheless, the survey results with respect to culture-specific tolerance of heavy binge drinking and drunkenness are really valuable.

### 6.6.2 Marginalisation processes

Within the period analysed, marginalisation processes in the Russian society have been largely reinforced by two groups of factors:

1. anomie, alienation, social isolation – further referred to as “social conditions” – and

---

29 Volga region ( PRIVOLZHSKII FEDERAL’NYI OKRUG) includes regions with a high proportion of ethnic groups with Moslem religious background: Republic of Tatarstan, Republic of Bashkortostan
DISCUSSION

(2) rapid unfavourable changes in economic environment – or “economic changes”

In a description of working class in a former steel-manufacturing town in England, Charlesworth (2000 p160) identified the same driving forces of marginalisation, which affected people’s identities and even their appearance:

“It is the economic changes and the social conditions they ushered in that have consigned these people to a life of marginality which, naturally enough, manifests itself in their comportment, manner and style”.

(1) Our analysis provided strong evidence that social conditions – anomie, alienation and social isolation – may impact on regional levels of fatal alcohol poisonings in a way that stress an importance of social context. All of the variables which have been used to measure these concepts were positively related to the incidence rates of alcohol-related deaths. This group of variables includes (in the descending order of the relative importance):

- divorces ($div$),
- abortions ($ab$),
- crime ($crime$) and
- unemployment rates ($ur$).

Broken family relationships (divorces and abortions), lack of societal cohesion and order, especially in relation to norms and values (crime), as well as the estrangement from meaningful work in which people can express themselves (unemployment) – these “classical” measures of social isolation, alienation and anomie have been widely used in different studies of alcohol-related problems and mortality.

(2) In order to characterise rapid unfavourable changes in the economic environment, we used two variables:

- financial losses of the population inversely measured as private savings per capita ($lsav$) and
- index of trade and services per capita ($ltraservC$) which approximates economic restructuring and its “side effects” – i.e. increasing economic polarisation and marginalisation.

In epidemiology and public health, there is a point of view that addictions are – to a considerable extent – born of disadvantage and deprivation (Mooney 2005). Our results support this position, indicating significantly higher alcohol poisoning mortality rates in the presence of deeper material deprivation and demanding “side effects” of the economic restructuring.

6.6.2.1 Social conditions – divorces

Married people have significantly lower risks of alcohol poisoning death (Poikolainen & Vuori 1985; Yoon et al 2003). In married females, the risks of hospital admissions due to alcohol poisonings, alcoholism and alcohol psychosis were significantly lower (Poikolainen 1982). In a U.S.-American longitudinal study with a 12-year follow-up period (Grant et al 2001), broken family relationships or being never married were significant predictors for the development of alcohol-related disorders – abuse and dependence. In a rural population of the Russian region Udmurtia, being divorced was the strongest correlate of male alcohol dependence (Pakriev et al 1998).
DISCUSSION

The finding we obtained documents a strong and positive aggregate-level association of alcohol poisoning mortality and divorce rates, which has never been reported before. This association is unlikely to be an “ecological fallacy”; very similar results have been observed at the individual level.

6.6.2.2 Social conditions – abortions

Durkheim (1897) coined the term anomie for a state in which social disruption of the community results in health risks for individuals. Women's status, alcohol and drug consumption have been discussed in the public health literature as determinants of anomie conditions (Laaser et al. 2002). Terminations of unwanted pregnancies via induced abortions can be considered to represent women's health risks closely linked with such conditions.

American epidemiological studies indicate that women with a history of induced abortions were more likely to be involved in other forms of risky behaviours – increased use of tobacco, alcohol, cocaine and other psychoactive substances (Matera et al. 1990; Coleman et al. 2005). In a Swedish study, a history of induced abortions was more common in women with risky sexual behaviour (travel sex). These women had more often experienced broken relationships and reported a more frequent use of alcohol or cannabis (Arvidson et al. 1997).

Although the Russian Federation demonstrates a clear downward trend of induced abortion rates (Figure 6-2), its figures exceed many times the average level of the EU-countries. Typically, a Russian woman underwent one abortion annually or approximately twenty abortions during the childbearing period of her life (Ruevekamp 1994).

![Figure 6-2 Abortions per 1000 live births](image)

Data source: WHO-HFA (state: June 2005)

Women seek abortions for many reasons. Low access to modern contraceptives is generally believed to be the crucial determinant of high abortion rates in Russia (Ruevekamp 1994; Kulczycki et al. 1996). Abortions are free, but contraception is not (Gadasina 1997). Therefore, abortions represented the most available method of family planning and fertility regulation. Popov (1990)
DISCUSSION

assumed that the USSR has undergone a demographic transition exclusively as a result of widespread use of induced abortions.

In Russian surveys, the leading subjective reasons mentioned by female respondents for the termination of unplanned pregnancies included poor housing conditions and financial difficulties (Dorman 1993), concern about the “ability to afford another child” and worries of women about their health status or that of their husbands (Vikhlayeva & Nikolaeva 1996).

Within the period analysed, abortion rates have considerably varied across regions. The lowest mean rates have been registered in the poor, but less anomic Republics of North Caucasus. Similar observations of Popov (1990) refer to the Soviet times.

Low abortion rates in these Republics are explained by high birth rates. In Dagestan, the mean birth rate exceeds nearly twice the Russian average. Paradoxically, the reasons for pregnancy termination which were mentioned by the respondents of the cited surveys seem to have little relevance for women in the poor Republics of the North Caucasus.

Accidental poisoning by alcohol is a predominantly men’s destiny. Therefore, the briefest interpretation of our findings is as follows: there is a significant, positive aggregate-level association of anomie-related health risks in Russian women and in men.

6.6.2.3 Social conditions – crime

The evidence available both from individual- and aggregate-level studies suggests that signs of heavy alcohol consumption are very common in disadvantaged populations with elevated levels of crime. However, the nature of this link is not yet properly explored.

Generally, the individual-level research on the links between crime and alcohol had two ultimate goals. Some authors examined the effects of alcohol-related disorders or intoxication on criminal behaviour. The others attempted to assess the prevalence of alcohol-related disorders among criminal offenders or their victims.

Thus, it has been shown that acute alcohol intoxication influences violent crime in a direct manner, whereas dependency predicts criminal recidivism (Pillmann et al 2000). A higher prevalence of alcohol-related disorders has been found among criminal offenders, as compared to the general population (Lindqvist 1986). In alcohol-dependent females, criminal behaviour was much more common than in the reference population (Modestin & Rigoni 2000). In a birth cohort of young adults from New Zealand, alcohol dependence was associated with an increased risk of violence. However, this association was non-significant. Among alcohol-dependent individuals, violence was best explained by substance use before the offence (Arseneault et al 2000). Finally, alcohol dependence and criminal recidivism conferred risk of being murdered, as demonstrated by the results of a Swedish matched case-control study (Allgulander & Nilsson 2000).

At the aggregate level, the primary concern of researchers was to measure the effects of alcohol consumption and availability on crime rates. In Texas (Zhu et al 2004) and New Jersey (Gorman et al 2001), higher availability of alcohol – measured as alcohol outlet density – was significantly associated with higher rates of violent crime, once neighbourhood social structure was taken into account. Alcohol prices were negatively related to violent crime rates, as demonstrated the results of victimisation surveys carried out in 16 developed countries (Markowitz 2000).

For a set of Russian regions, Andrienko (2001) confirmed the positive association of alcohol consumption – approximated by incidence of hospitalised alcohol psychoses – and violent crime.

---

30 Karachayevo-Cherkesskaya Respublika, Dagestan, Severnaya Osetiya and Adygeya
31 In 1990-2001, the mean birth rate in Dagestan was 21.2 per 1000 women aged 15-49, whereas the corresponding figure for all regions analysed was 10.45 (Data source: GOSKOMSTAT / FAIRS, state: 2002)
DISCUSSION

rates. The author discovered the opposite effects of alcohol on the rates of non-violent crime – larceny and theft.

Therefore, an alcohol-related “input” has been directly or indirectly hypothesised to represent a cause of a criminal “output”. Our main research question goes in the opposite direction – we intend to examine the impact of social tension/disruption on alcohol poisoning mortality. Such attempts to “see the matter in a different light” require a longitudinal approach. Since our panel data cover the time span of twelve years, our analysis provides an opportunity to combine simultaneously both the space and time domains of the populations studied. The results confirm that the unfavourable environment with higher regional crime levels can significantly increase the incidence of fatal alcohol poisoning rates. This association is adjusted for the effects of material deprivation, drinking habits and anomie-related variables. The unfavourable – criminal – environment is therefore likely to shape the heavy binge drinking practice of the regional populations.

Hill and Angel (2005) drew the same conclusion from the results of a neighbourhood study with a two-year follow-up period. The authors found that women who live in neighbourhoods they characterize as having a lot of problems with drugs, crime, teen pregnancy, unemployment, idle youth, abandoned houses, and unresponsive police drink more heavily or get drunk more often than those who report more order in their neighbourhoods. In dynamics, increasing perceived levels of “neighbourhood disorder” resulted in increased levels of drinking at the end of the follow-up period, even with adjustment for heavy drinking at baseline.

It is clear that alcohol availability alone is insufficient for the explanation of heavy drinking patterns in disadvantaged areas. Hill and Angel (2005) hypothesised that the relationship between the unfavourable environment and heavy drinking is mediated by psychological distress. There is some evidence to suggest that various aspects of the societal tolerance may also promote heavy drinking. That is, disadvantaged environment may provide a normative – or, better, anomic – context in which heavy drinking is not severely sanctioned (Crum et al 1996; Krivo & Peterson 1996).

6.6.2.4 Social conditions – unemployment

Only few research papers examined the relationships between the employment status and alcohol poisoning mortality, and none of them analysed Russian data. In Finland, Poikolainen and Vuori (1985) found elevated risks of fatal poisoning among those out of jobs, when other measures of the socioeconomic status were taken into account. Since alcohol-related disorders are assumed to precede fatal poisonings, we looked for studies which explored the links between unemployment and alcohol abuse or dependence. However, the evidence is rather contradictory.

In cross-sectional designs based on treatment samples, alcohol dependency was clearly associated with unemployment. Bendtsen et al (2002) came to this conclusion after they compared patients with alcohol-related disorders from a community-based treatment centre with a municipality reference population. Lejoyeux et al (2000) found that the prevalence of unemployment in alcoholics is even higher than in other diagnostic groups of patients admitted to psychiatric emergency services.

Ettner (1997) applied instrumental variables methods to cross-sectional data of the 1988 National Health Interview Survey (USA). She discovered that non-employment significantly diminished both alcohol consumption and dependence symptoms. Reduced income is suggested by the author as an explanation. On the contrary, acute job loss increased alcohol consumption in this sample of respondents.

The opposite direction of effects has been demonstrated by Khan et al (2002): recent unemployment decreases alcohol use while longer unemployment increases it. The authors examined
DISCUSSION


A structural equation model applied to data from more than 700 000 U.S.-American respondents – who participated in the Center for Disease Control and Prevention's Behavioral Risk Factor Surveillance System (BRFSS) surveys over the period 1984-1995 – provided robust evidence that the prevalence of binge drinking is strongly countercyclical. Furthermore, even among those who remain employed, binge drinking increased substantially during economic downturns (Dee 2001).

Our results are intrinsically close to those of studies based on longitudinal data (Dee 2001; Hill & Angel 2005). Russian regional ILO-unemployment rates are significantly associated with higher incidence of alcohol poisoning mortality. It is necessary to stress that those who die from alcohol poisonings are usually heavy drinkers. These people are likely to lose their jobs when economic conditions deteriorate. An additional impact of unemployment – and other factors of unfavourable environment – may cause alcohol-related disorders in this vulnerable population to become far more severe and to result in fatal alcohol poisoning.

6.6.2.5 Rapid unfavourable changes in economic environment

Material deprivation can increase heavy binge drinking (Khan et al 2002; Dooley & Prause 2002), especially among those who already suffer from alcohol abuse or dependency. The same may be true for drinking behaviour in relation to a low or marginal status in a society. Thus, in a prospective longitudinal study of homeless men in Munich (Fichter & Quadflieg 2003; 2005), alcohol dependency at baseline was associated with elevated levels of alcohol consumption, reduction of monthly income and higher death rates at three-year follow-up.

Furthermore, an experience of economic hardship and rapid income polarisation in a given society is likely to change population's attitudes towards heavy binge drinking and drunkenness. Reasons for drinking are based on needs and mood, and those drinking together are often share beliefs, expectancies and hardship (Koposov et al 2002). Therefore, a wide acceptance of “drowning sorrows and misery in alcohol” can potentially reinforce excessive alcohol consumption in marginalised heavy binge drinkers (Schroeder 2005).

In a rapidly changing and/or extremely disadvantaged environment, heavily dependent individuals are unlikely to fight their addiction (Meller et al 2000) even if their income reduces (Fichter & Quadflieg 2003). Rather, they will resort to cheap strong low-quality beverages and toxic counterfeits. This will increase their risks of fatal alcohol poisoning.

Our results support the position of Mooney (2005) and others who believe that addictions are “born of disadvantage and deprivation”. Alcohol poisoning mortality rates were found to be higher in the presence of unfavourable changes in the economic environment.

Problems of measurement are the basic limitation of this study. Since direct reliable measures of inequality and real per capita material wealth were not available, we were forced to use approximations, which are unfortunately somewhat inaccurate. Some proxies may be considerably biased. The latter refers to the index of trade and services (itraserivC). One of its basic components – i.e. retail trade turnover – includes, by definition, sales of alcoholic beverages. Therefore, its positive association with fatal alcohol poisoning rates gains an additional sense: the more vodka is sold, the higher the levels of alcohol-induced mortality (Poikolainen et al 2002). We have tried to explore this idea, using retail trade turnover per capita as an explanatory variable per se. However, its association with alcohol poisoning mortality rates was non-significant – probably, because of substantial spatial and temporal variations of the share of alcohol sales in the retail trade turnover. For this reason, we preferred to keep our index of trade and services in the final “best fitting” model.
DISCUSSION

We suppose that the role of the economic restructuring is extremely important. The development of consumer-oriented branches – combined with major changes in the structure of employment – has divided the Russian population into two big parts: the “winners” and “losers” of transition.

The losers are those whose human capital has been relatively devaluated, who have low incentives to acquire the new skills that are relevant to the emerging market economy. Given these characteristics, most losers are bound to remain losers. The related downward mobility in the socioeconomic status and increase in behavioural health risks – first of all, heavy binge drinking – causes some of them to become marginalised “newer-do-well” alcoholics.

6.7 Concluding remarks

6.7.1 Stress-related causes of death – suicide and homicide

The “best fitting” explanatory models of stress-related behavioural outcomes include some common regressors, which denote similarity in the “socioeconomic aetiology” of suicide and homicide in transitional Russia:

Table 6-1 Suicide and homicide – similarity in the “socioeconomic aetiology”

<table>
<thead>
<tr>
<th>Common regressors in the “best fitting” models of suicide and homicide mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core transition-related stressors</td>
</tr>
<tr>
<td>– financial losses of the population, inversely measured as private per capita</td>
</tr>
<tr>
<td>– hyperinflation assessed via Consumer Price Index</td>
</tr>
<tr>
<td>– hardship of climatic conditions</td>
</tr>
<tr>
<td>Factors related to “insane” social environment</td>
</tr>
<tr>
<td>– social tension / disruption</td>
</tr>
<tr>
<td>– heavy binge drinking</td>
</tr>
<tr>
<td>“Survival strategies” used to overcome economic hardship (coping)</td>
</tr>
<tr>
<td>– (complementary) economic activities</td>
</tr>
</tbody>
</table>

These results indicate that the main research hypotheses suggesting an explanation of violent mortality epidemics in Russia – i.e. the key role of the socioeconomic transition versus heavy binge drinking – do not contradict. They are rather the complement of each other.

We could not, however, assess the “pure effects” of heavy binge drinking in this study – non-confounded by income polarisation or the overall mental state of the Russian regional populations. Therefore, the observed effects of heavy binge drinking are likely to be overestimated.

On the other hand, even overstated impact of heavy binge drinking does not allow us to conclude about its leading role in determining suicide or homicide mortality. Heavy binge drinking was an important, but not the leading predictor of suicide and homicide death rates.

Let us summarise the most important peculiarities of the “socioeconomic aetiology” of stress-related causes of death. Tables 6-2 shows that the “best fitting” models are somewhat dissimilar. These dissimilarities may denote the presence of specific behavioural patterns, crucial for the manifestation of non-premeditated homicide or non-impulsive suicide in different stages of stress.

Some of the common regressors demonstrate different strength of relationships with the outcomes of interest. Thus, homicide mortality rates were more sensitive to acute unanticipated stressors – losses of private savings and hyperinflation. This increased “reactivity” of homicide
mortality can be treated as an argument for our hypothesis of homicide manifestation in the Alarm stage of stress.

Lack of economic activity turned out to be the most important predictor of increasing suicide mortality. Deficiency of protective resources and behavioural patterns of “escape” are crucial for the last stage of stress – Exhaustion, in which non-impulsive suicide is assumed to manifest. Therefore, these findings confirm our hypothesis.

If we look at “different regressors”, there will be a further support for our hypothesis of homicide manifestation in the Alarm stage of stress. The “best fitting” explanatory model includes “markers of wild capitalism” – i.e. excessive risks related to economic activities. Readiness to risks is one of the behavioural symptoms of Alarm.

Table 6-2 Suicide and homicide – dissimilarity in the “socioeconomic aetiology”

<table>
<thead>
<tr>
<th>Different regressors</th>
<th>Suicide</th>
<th>Homicide</th>
</tr>
</thead>
<tbody>
<tr>
<td>Different strength of relationships for the common regressors</td>
<td>the strongest predictor of suicide mortality rates: lack of (complementary) economic activities – termed as “economic passivity”</td>
<td>higher susceptibility of homicide rates to acute unanticipated stressors: financial losses of the population, inversely measured as private per capita savings; hyperinflation assessed via Consumer Price Index</td>
</tr>
<tr>
<td>Different regressors</td>
<td>higher mortality rates are determined by: (1) presence of factors related to a severe economic depression: low volume of industrial production, low “chances to get employed” (2) “Rural effects” (3) Lack of social cohesion / support</td>
<td>higher mortality rates are determined by: (1) presence of “wild capitalism markers” risks related to non-shadow economic activities risks related to (complementary) economic activities (2) low access to educational skills improvement (3) higher costs of living and production in climatically disadvantaged areas</td>
</tr>
</tbody>
</table>

Finally, the specific feature of Russian regional homicide is an enormous variability of mortality rates in space and time. For suicide mortality rates, such variability has not been observed.

6.7.2 Marginalisation-related causes of death – accidental poisoning by alcohol

The enormous scale of alcohol-related mortality in Russia has attracted the attention of scientists worldwide. There is a wide-spread practice of using alcohol poisoning deaths as a proxy for heavy binge drinking (e.g. Chenet et al 2001; Pridemore 2004). Nevertheless, the determinants of alcohol poisoning mortality remained largely unexplained. This study is the first empirical paper on these determinants in the regions of Russia.

Our aggregate-level results point out to a significant role of hazardous drinking habits which have been examined by urban/rural settings, educational resources and ethnic composition of the regional populations.

To a substantial part, fatal alcohol poisoning rates also depend on the extent of marginalisation-related processes in the regions analysed. The latter include two groups of factors:
DISCUSSION

(1) those characterising rapid unfavourable changes in the economic environment and
(2) those related to anomie, alienation and social isolation.

The nature of the casual connection between the unfavourable socio-economic environment and alcohol-induced mortality can be located in the larger context of the social selection / social causation controversy.

From one hand, the unfavourable socio-economic environment is likely to be responsible for an increase in the prevalence of behavioural health risk factors in the Russian population (social causation hypothesis).

From the other hand, marginalisation-related processes may first of all affect heavily dependent – i.e. sick – individuals, facilitating their downward mobility in the socioeconomic status and a further deterioration of their binge drinking behaviour, which may finally lead to alcohol poisoning death (social selection hypothesis).

We believe that both the social causation and social selection take place in transitional Russia. These processes are not inherently mutually exclusive; they may operate in a reciprocal sequence (Dooley & Prause 2002).

Our research has several limitations that should be mentioned here. One of them – and, probably, the most important – is the problem of omitted variables. Our models indicate the presence of the unobserved cross-sectional region-specific heterogeneity – i.e. variability of mortality patterns which could not be captured by the given set of explanatory variables. Additional determinants of alcohol poisoning mortality are likely to exist. Perhaps, they refer to the availability of low-quality alcohol and toxic counterfeits. Therefore, our econometric models show a moderate fit with the data.

The second limitation refers to the problem of measurement accuracy. If the quality of mortality statistics can be considered to be appropriate, this can not be asserted with respect to monetary-based indicators or unemployment rates. The unemployment parameters, disclosed by labour force surveys, do not exactly mirror the actual labour market situation (ILO 2001 p41). The effects of shadow economy can result in an underestimation of retail trade turnover or paid services provided to the population. Finally, official data on private per capita savings do not take into account “under-the-mattress” deposits.

Despite these limitations, our study presents novel evidence on the relationships between the socioeconomic environment, drinking habits and fatal alcohol poisoning rates in the regions of Russia. The study results support our basic hypotheses about the impact of marginalisation-related processes and drinking habits on the extent of alcohol-related mortality.
CHAPTER 7 – DRAWING CONSEQUENCES
7.1 Generalisability of inferences

Our analytical evidence is based on a set of 77 administrative areas of the Russian Federation. Twelve areas were excluded, basically due to incomplete data – among them are wealthy oil-producing autonomous districts of West Siberia and extremely poor Republics of the North Caucasus. Therefore, the question arises, whether the results obtained can be generalised for the whole totality of the Russian regions.

Strictly speaking, any generalisation of inferences should be made with caution, if the units analysed represent non-randomly selected geographic areas with a potentially unique constellation of the socioeconomic, climatic, demographic etc conditions. If conditions are the same, the external validity – generalisability – can be provided.

Since we have no access to the full set of data on some regions, the judgement about the generalisability of inferences may only be based on indirect evidence of conditions’ similarity or dissimilarity. Specifically for the Republic of Chechnya, the external validity of our study results (from all models) may be strongly limited. This Republic is characterised by a profound economic collapse, further aggravated by the presence of an extreme instability, political, ethnic and military conflicts. Virtually, there is a frontier between the internal Russia and the Chechnya; the Republic’s economic contacts with other regions are suspended, and the prerequisites for the economic development are not being formed (Granberg 2004 p335).

In the previous chapter, we have discussed the basic limitations of our models which are especially serious in the case of alcohol poisoning mortality – for instance, lack of data on hypothetically important predictors of fatal alcohol poisonings, presence of unobserved region-specific effects etc. Given these limitations, any generalisation of inferences beyond the analysed set of regions would be questionable in quantitative terms.

Nevertheless, it does not mean that our qualitative inferences – i.e. general strategies on mortality reduction – would not be applicable in the regions omitted in the suggested econometric models. Since the same socioeconomic forces acted in the whole country within the time span analysed, we may assume that our general recommendations will be valid for the whole totality of Russian administrative areas.

7.2 Regional diversity

The spatial structure of the Russian Federation is very complex. Generally speaking, it represents a system of “countries”, and each “country” has its unique set of characteristic features. These features are often not a direct, total-lot result of the socioeconomic transition; some of them have evolved over the decades or centuries, based on a variety of natural, economic and human resources.

The most stable traits may be reflected in the attitudes and behaviour of the population born and bred in a particular area. The quotation below describes some peculiarities of mindset and living standards of ethnic Russian population in Siberia at the beginning of the 20th century (Alekseev & Nikolina 2002 p285):

The Russian population in Siberia can be divided into two distinct groups – old residents whose forefathers left European Russia long ago and new settlers who came to Siberia.

---

32 such as Khanty-Mansiiskii and Yamalo-Nenetskii avtonomnyi okrug
33 such as Chechenskaya Respublika (Chechnya) and Respublika Ingushetiya
only 15-20 years ago. Old residents can be characterised by a high level of wealth; both their appearance and cultural attitudes are very special.

The permanent struggle against severe climatic conditions developed a true grit in Siberians, along with the spirit of enterprise, gumption and pragmatism. The virtual absence of serfdom encouraged their independence and initiative. The despotic oppressions of bureaucrats enhanced the ability of Siberians to adjust to any conditions; they became canny, secretive and mistrustful. Life in isolation made them rather rugged, wild and disinterested in public affairs.

In old Siberian residents, the level of material wealth is considerably higher than in Russian peasants. New settlers did not yet completely manage to set up house and home; they have relatively low living standards. Often, they have to leave their plots due to the unfavourable conditions of their new residence. They are forced to seek better places or to return to European Russia.

Since Siberians come from different parts of European Russia, their anthropological and linguistic characteristics are not uniform.

Although this description may not completely fit with the modern conditions, it illustrates that some relatively stable traits of the regional environment – e.g., those related to natural resources or climatic conditions – may determine demographic processes (such as migration) and the mindset of a given population. These premises may also be relevant for the population’s health.

Our findings revealed an enormous variability of mortality patterns across regions. There are clear “zonal patterns” in the spatial distribution of violent and alcohol-related mortality. In Chapter 2, we described high-mortality zones, which should be considered as target areas of particular importance in the elaboration of mortality reduction policies.

These target areas include the regions within the high-binge-drinking zone (Figure 7-1), high-suicide zone (Figure 7-2) and high-homicide zone (Figure 7-3).

Sixteen “federation subjects” demonstrate high mortality rates for all analysed causes of death (Figure 7-4): Tver region, Republic of Karelia, Arkhangelsk region, Republics of Komi and Mariy El, Udmurt Republic, Perm and Sverdlovsk regions, Altai territory, Republic of Altai, Kemerov region, Republic of Tuva, Irkutsk, Chita, Amur and Sakhalin regions (listed from west to east).

The socioeconomic conditions vary greatly in the areas within high-mortality zones. However, none of these areas have good conditions. All of them are characterised as “problem regions”, requiring state support in order to overcome the socioeconomic difficulties (Granberg 2004 p317-344). They include:

- “retarded regions” with extremely low living standards of the populations,34
- “depressive regions” – for instance, old-industrialised or coal-mining areas with a considerable production downswing and high unemployment,35
- northern regions with severe climatic conditions and migration outflow, which went through transition from relative wealth of the Soviet times to a real poverty,36 as well as

34 e.g., Republics of Tuva and Mariy El, as well as Chita region, with the majority of the population living below the official poverty level in 1997 (Granberg 2004 p295)
35 e.g., Vladimir, Ivanovo and Pskov regions, Chuvash and Udmurt Republics, Kirov region, Altai and Khabarovsk territories, Amur region (Granberg 2004 p329)
36 e.g., Republics of Karelia and Komi, Arkhangelsk region, partly Magadan, Sakhalin and Irkutsk regions (Granberg 2004 p341-342)
The transition reforms brought about increasing socioeconomic differentiation of regions – first of all, due to widening geography of “problem regions”. At the same time, growing regional differentials of violent and alcohol-related mortality levels have been observed.

Increasing spatial mismatch is recognised to have a harmful impact on the socioeconomic stability of countries affected. It is associated with increased risks of interregional conflicts and local crises, disintegration of national economy, growing societal tension and disruption (Granberg 2004 p285).

We believe that the improvement of the socioeconomic conditions in the “problem regions” with high mortality levels will result in a significant reduction of the country's death rates. In order to effectively combat violent and alcohol-related mortality in Russia, targeted policy measures are needed, focussing on the “problem regions” with their specific challenges and potentials for the economic development. One suggestion for the “retarded” Republic of Tuva directly follows from our modelling results – extremely high homicide mortality may probably be reduced, if real income per capita will grow in this “federation subject”.

An inherent prerequisite for the elaboration of targeted policy programs can be created by means of in-depth analyses of high-risk population groups (e.g., by age, gender, SES) and mortality risk factors – especially within the “problem areas”. These analyses should take into account the peculiarities of local conditions at a more disaggregated (sub-regional) level.

For the sixteen “federation subjects” mortality reduction must obtain the status of a priority direction in the public health policy.

7.3 Strategies to reduce mortality

Essentially, this chapter is not devoted to a discussion of prevention policy alternatives. An effective prevention of excess violent and alcohol-related deaths is an extremely complex task, especially during the period of major socioeconomic changes. We have some doubt that any uniform set of strategies would be equally effective throughout Russia. Mortality patterns vary greatly across regions. Similarly, there are enormous differences in the characteristics of regional socioeconomic environment. Therefore, policies on mortality reduction should be targeted to specific groups of regions or even sub-regional areas with common conditions. The detailed elaboration of such policies lies beyond the scope of this paper; it requires careful consideration of age- and gender-specific mortality patterns in the particular subgroups of areas. Therefore, additional research efforts are needed for this purpose.

Nevertheless, our findings enable us to make some general inferences regarding violent and alcohol-related mortality in Russian regions and to formulate a few suggestions on how this mortality should be tackled.

7.3.1 Stimulation of economic activities of the population

During the period analysed, (complementary) economic activities appeared to be an important survival strategy of the population. As follows from our study results, stimulation of economic
activities would be especially effective for the prevention of excess suicide mortality. This measure would also reduce homicide death rates.

In the poor and "depressive" regions, business activities are discouraged by the factors related to poor economic environment – e.g., low purchasing capacity of the population, poor trade infrastructure. Therefore, stimulation of business activities is inseparable from policy measures targeted to an improvement of regional economic environment in disadvantaged areas.

7.3.2 Effective labour market policies, reliable social protection system and legal regulations of labour security

As confirmed by our explanatory models, rises in “hidden” and “open” unemployment contributed to increasing suicide and alcohol-related mortality. There is indication that public policies aimed at supporting employment, job-seeking and re-employment would be helpful in reduction both stress- and marginalisation-related mortality.

During the transition period, the deficiency of such policy programs has been obvious in Russia. Local labour market institutions could not provide a sufficient support for people hit by unemployment; the inter- and intra-regional migration of job-seekers has been complicated by lack of information on job opportunities in other areas, narrowness of the housing market, high transportation expenses and far distances (Nesporova 2000 p212; ILO 2001 p35-39). Thus, labour market processes have triggered income polarisation and poverty. On the other hand, these processes have intensified the spatial mismatch and societal tensions.

Since any policy to reduce unemployment level is doomed during a severe recession, economic stabilisation and sustainable growth is considered to be an important prerequisite for the creation of new working places and the introduction of successful measures to counteract unemployment. The second precondition refers to a strategic planning and managed restructuring of the economy (ILO 2001 p45).

ILO suggested some general recommendations aimed at unemployment reduction in the regions of Russia (2001 p46):

- Effective mechanisms of financing should be developed for active and passive labour market policies.
- The functioning of the State Employment Services is also to be improved. That implies shifting emphasis from registration and re-registration of unemployed to a professional counselling, career guidance and psychological help.
- For the areas with the increased labour market tension, specific programs should be created to enhance employment opportunities of the population.
- Labour legislation should be reformed.
- Finally, an adequate financial support of unemployed persons (unemployment benefits) is to be provided.

These recommendations also address the issues of effective regulations of labour security and development of reliable social protection system, which – together with the optimisation of tax structures – would tackle risks related to economic activities of the population. The reduction of these risks – termed otherwise in this paper as “wild capitalism markers” – would probably result in decreasing homicide mortality levels.
7.3.3 Preventing financial losses of the population and hyperinflation

Based on the findings of our study, a conclusion can be drawn that any new large increase in the price level would probably bring about rising stress-related mortality in Russia, especially in climatically disadvantaged areas. Vice versa, stabilisation of prices for consumer goods may probably result in decreasing mortality.

Within the time span analysed, an additional effect of hyperinflation expressed itself in the devaluation of private savings deposits and growing material deprivation of the regional populations. Financial losses of the population should be prevented, since they are significantly related to higher stress- and marginalisation-related mortality.

7.3.4 Rural health policy

In general, rural areas of Russia are characterised by higher suicide and alcohol poisoning mortality rates. “Rural effects” have been confirmed in the econometric models presented in this paper. This evidence indicates poorer mental health of the rural population and implies a necessity of specific programs of surveillance, health care and health education in rural settings.

7.3.5 Strengthening law and order

Our finding of positive relationships between crime and mortality rates indicates that a considerable number of deaths due to stress- and marginalisation-related causes can probably be prevented by strengthening the regulatory role of services dealing with security and justice safeguarding. The key role in this area belongs to the state, police, public organisations and mass media.

Popularisation of aggression and cruelty by the state and private mass media should be stopped. Crime and violence should be regarded as inadmissible patterns of behaviour. This measures could probably reduce the likelihood of “imitative learning” in children and adolescents.

Better policing, effective and humane penitentiary system should contribute to a substantial improvement of security, decline of crime rates, reduction of marginality and better social environment in the regions of Russia. Perhaps, these measures will decrease violence expectations in the public and increase the sense of coherence and effective coping with stress.

7.3.6 Alcohol policies and heavy binge drinking

The given study demonstrated positive aggregate-level associations between fatal alcohol poisonings and stress-related mortality. However, at present, these findings do not enable us to derive sound and quantifiable policy recommendations from these findings. A lot of research work needs to be done to address the nature of these associations. As stated above, the observed effects of “heavy binge drinking” are likely to be overestimated – mostly due to the confounding by the overall mental health of the regional populations and other hypothetically important determinants – such as growing socioeconomic polarisation.

For the reduction of alcohol-related harm, it is usually recommended to introduce public health education programs informing people about the risks of excessive drinking, as well as to control alcohol consumption through price policy mechanisms, administrative or legal restrictions etc (Cornia & Paniccià 2000 p34-35). However, these approaches might be ineffective or politically unacceptable in Russia.

Higher alcohol prices might trigger an increase in home distillation and illegal imports. In this case, the share of low-quality alcoholic beverages in overall consumption may grow. Therefore, this policy is unlikely to succeed, unless the capacity to control illicit imports and home distillation
will be strengthened in parallel. On the other hand, this measure might significantly reduce alcohol demand – primarily among those who are not alcohol dependent – and revenue from sales.

Administrative / legal restrictions regulating the ability and conditions of alcohol use and sale have been shown to have some effect (Cornia & Paniccià 2000 p35). They include minimum age limits for consumers, rationing sales, monopolisation of retail trade, limiting number of outlets, days, hours and conditions of sale, advertising and promotion restrictions etc. These policies might, however, contradict the free market ideology. At the same time, their implementation may be associated with reduction in taxes. Therefore, their realisation might be of limited reach.

Educational programs will not substantially hurt economic interests. In general, they operate slowly, entail a complex political economy and require a sophisticated manpower infrastructure for their implementation. In addition, they must perfectly fit with the mindset of definite target groups, otherwise they will be ineffective.

The approach that we believe might be helpful in the regions of Russia is based on the results of this study. First of all, it should be aimed at stress- and marginalisation-related processes approximated by the common explanatory variables in the models of stress- and alcohol-induced mortality. The main strategies may include prevention of material deprivation and financial losses of the population, de-criminalisation of society and reduction of social tension / social disruption, as well as counteracting of unemployment.

7.3.7 Strengthening social cohesion and non-material values

There is a good reason to believe that strengthening of social cohesion / support and other non-material values may have a powerful potential for prevention of stress- and alcohol-related mortality. Better patterns of social cohesion\(^{38}\) – together with negative culture-specific attitudes to binge drinking and drunkenness – exhibited a protective effect on suicide and alcohol poisoning mortality rates in the regions of Russia. A harmful impact on alcohol-induced mortality has been produced by the measures of anomie and broken family relationships – divorces and abortions.

Better patterns of social cohesion and family support played probably the key role in protecting the population of the poor North Caucasus regions from excess unnatural mortality. Death rates remained low in these regions despite severe economic shocks of the transition period.

This evidence points to a necessity of policy programs aimed at strengthening of social cohesion, family support and other non-material values – religious, spiritual, societal, cultural etc.

7.3.8 Augmentation of resources for educational skills improvement

This approach might probably be helpful for the prevention of excess homicide and heavy binge drinking mortality. In particular, it can include a better access to internet and other information sources in remote areas – e.g. about job vacancies or training programs – wide use of modern technique etc.

A very promising approach to violence prevention – completing secondary and post-secondary education while in prison – is likely to be useful for the areas of the former convicts’ residence. This strategy – targeted at heavily disadvantaged population groups – might enable high-risk people to improve their skills, restore self-confidence, enhance employment opportunities and prevent recidivism (Gilligan 2000).

---

\(^{38}\) approximated by the variable “ethnic composition of the regional population”
7.4 Novelty of findings and approaches

We have suggested some new conceptual approaches to studying determinants of suicide, homicide and alcohol poisoning mortality in transition countries. The practical realisation of these conceptual ideas has been accomplished by means of pooled cross-sectional time series analyses. This econometric technique – still quite uncommon in the epidemiologic research – enabled us to take advantage of spatial diversity and time domains of Russian regional areas, as well as to obtain some pioneer findings.

7.4.1 Aggregate-level determinants of fatal alcohol poisonings

This paper presents the first empirical study on the aggregate-level determinants of fatal alcohol poisonings. There is a widespread opinion prevailing both in the public and in the scientific community that alcohol-related mortality is basically determined by the national drinking habits. This point of view results in accusations, “blaming the victim” and, probably, even causes disinterest of decision-makers in new research studies aimed at understanding of modifiable associations with further risk factors.

Indeed, our study confirmed a hazardous role of binge drinking habits, which vary by urban/rural settings, access to educational resources and ethnic composition of the regional population. These findings indicate the presence of an untapped potential for the targeted research and prevention of lifestyle-related risk factors in the regions of the Russian Federation.

Another set of new findings refers to a significant impact of marginalisation-related processes on alcohol poisoning mortality. Some of these processes were directly spurred up by the painful economic reforms of the transition period – namely those related to rapid unfavourable changes in the regional economic environment. To a substantial degree, alcohol poisoning mortality represents an outcome of anomie, alienation and social isolation. Probably, the same direction of associations can be found for any other transition country with a high level of alcohol-related mortality. Additional research studies might shed the light on the relationships between the hard challenges experienced by the populations during the socioeconomic transition and alcohol poisoning mortality.

7.4.2 Transition-related stressors and coping resources of the population

Many scholars have recognised the stressful nature of changes experienced by the populations of transition countries (Shapiro 1995; Anderson 1997; Leon & Shkolnikov 1998; Stone 2000). Therefore, the very idea of transition-related stress is not particularly new. We tried to systematically explore the issue of its measurement, and these attempts resulted in a novel carefully designed practical approach to analysing the effects of some core transition-specific stressors in the regions of Russia.

This approach enabled us to discover some significant aggregate-level relationships which have never been reported before. Thus, it was possible to measure both the “material” and “psychological” effects of hyperinflation on suicide mortality. For homicide mortality, we assessed a hazardous impact of higher living and production costs in climatically disadvantaged areas.

Wherever possible, we have tried to take into account the most important coping resources and factors related to stress vulnerability of the regional populations. For the “classical” individual- and aggregate-level determinants of suicide and homicide mortality (education, heavy binge drinking etc), we observed the same direction of relationships as reported in many other studies. In addition, some new evidence has been provided, concerning significance of transition-specific “sur-
vival strategies” – i.e. (complementary) economic activities of the population. Lack of economic activities turned out to be the strongest predictor of suicide mortality in our study.

### 7.4.3 Psychosocial model of transition-related stress and its outcomes

We considered the differences and commonalities in the “socioeconomic aetiology” of suicide and homicide mortality in transitional Russia. This approach has been guided by the concept of phase-wise stress development (Selye 1982; 1985) accompanied by a variety of psychological symptoms and behavioural patterns which manifest at different stress stages. In accordance with this biologically plausible approach, non-premeditated homicide and non-impulsive suicide have been located within the first (Alarm) and the last (Exhaustion) stages of stress, respectively.

For practical purposes, these behavioural stress outcomes can be “released” from confusing labels of psychiatric diagnoses – like depression or personality disorders. An opportunity to carry out an “impartial” examination of these diagnosis-unspecific phenomena – at both the individual and population level – might gain a considerable advantage in terms of new effective prevention strategies.

Thus, we were able to identify some significant aggregate-level equivalents for the behavioural patterns of “escape” and “excessive (economic) risks” in the regional populations. The given patterns were assumed to be crucial for the manifestation of suicide and homicide. These findings might be important for the elaboration of effective policies aimed at suicide and homicide mortality reduction.

The suggested model can be extended by the examination of other outcomes – such as, stress-related chronic somatic conditions (cardiovascular diseases etc). Its further refinement can be achieved in prospective designs with a multi-level analytical approach – e.g., studying of determinants of ischemic heart disease incidence.
Table 7-1 List of administrative areas depicted in Figures 7-1 to 7-4 (Moscow and St. Petersburg excluded)

<table>
<thead>
<tr>
<th>No.</th>
<th>NAMES USED[^]</th>
<th>TRANSCRIPTION OF ORIGINAL NAMES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Taimyrskii (Dolgano-Nenetskii) avtonomnyi okrug</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Murmansk region</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Republic of Sakha (Yakutia)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Murmanskaya oblast'</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Evenkiiskii avtonomnyi okrug</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Komi-Permyatskii avtonomnyi okrug</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Kirovskaya oblast'</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Tomsk region</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Tyumenskaya oblast'</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Kostromskaya oblast'</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Magadanskaya oblast'</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Pskovskaya oblast'</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Yaroslavskaya oblast'</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Tverskaya oblast'</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Omsk region</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Chitinskaya oblast'</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Nizhegorodskaya oblast'</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Ivanovskaya oblast'</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Novosibirskaya oblast'</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Respublika Buryatiya</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Amurskaya oblast'</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Moskovskaya oblast'</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Kurganskaya oblast'</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Kemerovskaya oblast'</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Vladiminskaya oblast'</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Respublika Tatarstan</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Respublika Bashkortostan</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Chelyabinskaya oblast'</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>Chuvashskaya Respublika</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Smolenskaya oblast'</td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>Respublika Khakasiya</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>Ryazanskaya oblast'</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>Kaluzhskaya oblast'</td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>Respublika Mordovia</td>
<td></td>
</tr>
</tbody>
</table>

[^]: If NAMES USED are not indicated, the regions are omitted (not analysed) in this paper.

- 191 -
<table>
<thead>
<tr>
<th></th>
<th>Region</th>
<th>Russian Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>51</td>
<td>Ulyanovsk region</td>
<td>Ulyanovskaya oblast'</td>
</tr>
<tr>
<td>52</td>
<td>Kamchatka region</td>
<td>Kamchatskaya oblast'</td>
</tr>
<tr>
<td>53</td>
<td>Tula region</td>
<td>Tul'skaya oblast'</td>
</tr>
<tr>
<td>54</td>
<td>Samara region</td>
<td>Samarskaya oblast'</td>
</tr>
<tr>
<td>55</td>
<td>Kaliningrad region</td>
<td>Kaliningradskaya oblast'</td>
</tr>
<tr>
<td>56</td>
<td>Khabarovsky territory</td>
<td>Khabarovskii krai</td>
</tr>
<tr>
<td>57</td>
<td>Altai territory</td>
<td>Altaiskii krai</td>
</tr>
<tr>
<td>58</td>
<td>Orenburg region</td>
<td>Orenburgskaya oblast'</td>
</tr>
<tr>
<td>59</td>
<td>Ust'-Ordinsky Buryatski avtonomnyi okrug</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>Bryansk region</td>
<td>Bryanskaya oblast'</td>
</tr>
<tr>
<td>61</td>
<td>Penza region</td>
<td>Penzenskaya oblast'</td>
</tr>
<tr>
<td>62</td>
<td>Tambov region</td>
<td>Tambovskaya oblast'</td>
</tr>
<tr>
<td>63</td>
<td>Republic of Tuva</td>
<td>Respublika Tuva</td>
</tr>
<tr>
<td>64</td>
<td>Oryol region</td>
<td>Orlovskaya oblast'</td>
</tr>
<tr>
<td>65</td>
<td>Lipetsk region</td>
<td>Lipetskaya oblast'</td>
</tr>
<tr>
<td>66</td>
<td>Saratov region</td>
<td>Saratovskaya oblast'</td>
</tr>
<tr>
<td>67</td>
<td>Republic of Altai</td>
<td>Respublika Altai</td>
</tr>
<tr>
<td>68</td>
<td>Kursk region</td>
<td>Kurskaya oblast'</td>
</tr>
<tr>
<td>69</td>
<td>Voronezh region</td>
<td>Voronezhskaya oblast'</td>
</tr>
<tr>
<td>70</td>
<td>Aginskii Buryatski avtonomnyi okrug</td>
<td></td>
</tr>
<tr>
<td>71</td>
<td>Belgorod region</td>
<td>Belgorodskaya oblast'</td>
</tr>
<tr>
<td>72</td>
<td>Volgograd region</td>
<td>Volgogradskaya oblast'</td>
</tr>
<tr>
<td>73</td>
<td>Rostov region</td>
<td>Rostovskaya oblast'</td>
</tr>
<tr>
<td>74</td>
<td>Jewish autonomous region</td>
<td>Evreiskaya avtonomnaya oblast'</td>
</tr>
<tr>
<td>75</td>
<td>Primorsky territory</td>
<td>Primorskii krai</td>
</tr>
<tr>
<td>76</td>
<td>Sakhalin region</td>
<td>Sakhalinskaya oblast'</td>
</tr>
<tr>
<td>77</td>
<td>Krasnodar territory</td>
<td>Krasnodarski krai</td>
</tr>
<tr>
<td>78</td>
<td>Stavropol territory</td>
<td>Stavropol'skii krai</td>
</tr>
<tr>
<td>79</td>
<td>Republic of Adygeya</td>
<td>Respublika Adygeya</td>
</tr>
<tr>
<td>80</td>
<td>Karachaev-Circassian</td>
<td>Karachaevo-Cherkesskaya Respublika</td>
</tr>
<tr>
<td>81</td>
<td>Kabardian-Balkar Republic</td>
<td>Kabardino-Balkarskaya Respublika</td>
</tr>
<tr>
<td>82</td>
<td>Republic of North Ossetia</td>
<td>Respublika Severnaya Ossetya</td>
</tr>
<tr>
<td>83</td>
<td>Ingusheskaya Respublika</td>
<td></td>
</tr>
<tr>
<td>84</td>
<td>Astrakhan region</td>
<td>Astrakhanskaya oblast'</td>
</tr>
<tr>
<td>85</td>
<td>Republic of Kalmykia</td>
<td>Respublika Kalmykiya</td>
</tr>
<tr>
<td>86</td>
<td>Republic of Dagestan</td>
<td>Respublika Dagestan</td>
</tr>
<tr>
<td>87</td>
<td>Chechenskaya Respublika (Chechnya)</td>
<td></td>
</tr>
</tbody>
</table>
Figure 7-1 High binge drinking zone
DRAWING CONSEQUENCES

Figure 7-2 High suicide zone
Figure 7-3 High-homicide zone
Figure 7-4 Regions with high levels of homicide, suicide and alcohol poisoning mortality
REFERENCES


Boor M & Bair JH (1990) Suicide rates, handgun control laws and sociodemographic variables. Psychological reports 66(3 Pt 1): 923-930


multisite case control study. *American journal of public health* 93(7): 1089-1097

Cantor CH Slater PJ & Najman JM (1995) Socioeconomic indices and suicide rate in

Cassel J (1976) The contribution of the social environment to host resistance: the Fourth Wade


science international* 140(2-3): 261-267

University Press

the possible contribution of binge drinking. *International journal of epidemiology* 30(4): 743-
748

mortality in Moscow; new evidence of a causal association. *Journal of epidemiology and
community health* 52(12): 772-774

the literature. *Alcoholism, clinical and experimental research* 28(5 Supplement): 18S-28S

psychiatrica Scandinavica* 108(5): 350-358

analysis from the EU project “Alcohol consumption and alcohol problems among women in
European countries”. *Substance abuse* 22(1): 55-67

Cockerham WC (2000) Health lifestyles in Russia. *Social science & medicine* 51(9): 1313-1324

mediators. *Social science & medicine* 57(9): 1631-1641

Cohen F & Lazarus R (1979) Active coping processes, coping dispositions, and recovery from

Coleman PK, Reardon DC & Cougle JR (2005) Substance use among pregnant women in the
context of previous reproductive loss and desire for current pregnancy. *British journal of
health psychology* 10(Pt 2): 255-268

Sciences* 932:132-150

Martin SE (ed.) *Alcohol and Interpersonal Violence*. NIAAA Research Monograph No 24,
NIH Pub No 93-3496. Rockville, MD: NIAAA

of the American Medical Association* 294(5): 598-601

and reactive violent offenders. *Journal of consulting and clinical psychology* 64(4): 783-790


- 204 -


Guerry A (1833) Essai sur la statistique morale de la France. Paris: Crochard


Hakkanen H (2005) Homicide by ligature strangulation in Finland: offence and offender characteristics. Forensic science international 152(1): 61-64


Hawkins DF (1993) Inequality, culture, and interpersonal violence. Health affairs 12(4): 80-95


Heatley MK & Crane J (1990) The blood alcohol concentration at post-mortem in 175 fatal cases of alcohol intoxication. Medicine, science, and the law 30(2): 101-105

- 205 -


Lagutenko BT (2001) *Spravochnik po ekonomicheskoi geografii Rossii*. Moscow: Yurist


Leifman H (2001a) Estimations of unrecorded alcohol consumption levels and trends in 14 European countries. *Nordic studies on alcohol and drug* 18: 45-69 (English Supplement)


Nemtsov AV (2003) *Alkogol'nyii uron regionov Rossii.* Moscow: Nalex


Ostroumov S (1914) *Is istorii p’yansva na Rusi*. St Petersburg: Obschestvo “Aleksandr Nevskii”


- 212 -


Raine A, Brennan P & Mednik SA (1994) Birth complications combined with early maternal rejection at age 1 year predispose to violent crime at age 18 years. *Archives of general psychiatry* 51(12): 984-988


Schneider F (2003) The size and development of the shadow economies and shadow economy labor force of 22 transition and 21 OECD countries: what do we really know? In: Belev B
(ed.) The informal economy in the EU accession countries. Size, scope, trends and challenges to the process of EU enlargement. Sofia: Center for the Study of Democracy


Schulz M & Schmolot A (1997) Therapeutic and toxic blood concentrations of more than 500 drugs. Pharmazie 52(12):895–891


Shaw C & McKay H (1942) Juvenile delinquency and urban areas. Chicago: University of Chicago Press


Tissot J (1840) *De la manie du suicide et de l'esprit de révolte, de leurs causes et de leurs remèdes*. Paris: Lagrange


- 217 -


Zaigraev G (1992) *Obshchestvo i alkogol'.* Moscow: NII MVD RF


Zdravomyslova EA & Temkina AA (1997) *Sotsial’nyaya konstruktsiya gendera i gendernaya sistema v Rossii. Materialy pervoi Rossijskoj letnei shkoly po zhenskim i gendernym issledovaniyam.* Moscow: Moskovskii Tsents Gendernyk Issledovanii

- 219 -
Zeigarnik BV (1986) *Patopsikhologiya. 2nd ed.* Moscow: Izdatel'stvo Moskovskogo universiteta


ANNEX – MAPS
Russia, SDR 1990, Suicide and self-inflicted injury, both sexes, all ages
Russia, SDR 1991, Suicide and self-inflicted injury, both sexes, all ages
Russia, SDR 1992, Suicide and self-inflicted injury, both sexes, all ages

SDR per 100,000
- <15.1
- 15.1 - 25.0
- 25.1 - 35.0
- 35.1 - 45.0
- 45.1 - 55.0
- 55.1 - 65.0
- >65.0
Russia, SDR 1993, Suicide and self-inflicted injury, both sexes, all ages
Russia, SDR 1994, Suicide and self-inflicted injury, both sexes, all ages
Russia, SDR 1995, Suicide and self-inflicted injury, both sexes, all ages
Russia, SDR 1996, Suicide and self-inflicted injury, both sexes, all ages

SDR per 100,000

- <15.1
- 15.1 - 25.0
- 25.1 - 35.0
- 35.1 - 45.0
- 45.1 - 55.0
- 55.1 - 65.0
- >65.0
Russia, SDR 1997, Suicide and self-inflicted injury, both sexes, all ages

SDR per 100,000
- <15.1
- 15.1 - 25.0
- 26.1 - 35.0
- 36.1 - 45.0
- 46.1 - 55.0
- 56.1 - 65.0
- >65.0

- 229 -
Russia, SDR 1998, Suicide and self-inflicted injury, both sexes, all ages
Russia, SDR 1999, Suicide and self-inflicted injury, both sexes, all ages
Russia, SDR 2000, Suicide and self-inflicted injury, both sexes, all ages
Russia, SDR 1990, Homicide, both sexes, all ages
Russia, SDR 1991, Homicide, both sexes, all ages

SDR per 100 000

- <0.1
- 0.1 - 10.0
- 10.1 - 20.0
- 20.1 - 30.0
- 30.1 - 40.0
- 40.1 - 50.0
- >50.0
Russia, SDR 1992, Homicide, both sexes, all ages

SDR per 100,000
- <8.1
- 8.1 - 18.0
- 18.1 - 28.0
- 28.1 - 38.0
- 38.1 - 48.0
- 48.1 - 58.0
- >58.0
Russia, SDR 1993, Homicide, both sexes, all ages

SDR per 100 000
- <3.1
- 3.1 - 8.0
- 8.1 - 18.0
- 18.1 - 28.0
- 28.1 - 38.0
- 38.1 - 48.0
- 48.1 - 58.0
- >58.0
Russia, SDR 1994, Homicide, both sexes, all ages
Russia, SDR 1996, Homicide, both sexes, all ages

SDR per 100 000

- <8.1
- 8.1 - 10.0
- 10.1 - 12.0
- 12.1 - 14.0
- 14.1 - 16.0
- 16.1 - 18.0
- 18.1 - 20.0
- 20.1 - 22.0
- 22.1 - 24.0
- 24.1 - 26.0
- 26.1 - 28.0
- 28.1 - 30.0
- 30.1 - 32.0
- 32.1 - 34.0
- 34.1 - 36.0
- 36.1 - 38.0
- 38.1 - 40.0
- 40.1 - 42.0
- 42.1 - 44.0
- 44.1 - 46.0
- 46.1 - 48.0
- >48.0
- >50.0
Russia, SDR 1997, Homicide, both sexes, all ages

SDR per 100,000
- <3.1
- 3.1 - 18.0
- 18.1 - 28.0
- 28.1 - 38.0
- 38.1 - 48.0
- 48.1 - 58.0
- >58.0
Russia, SDR 1998, Homicide, both sexes, all ages
Russia, SDR 2000, Homicide, both sexes, all ages
Russia, SDR 1990, Accidental Alcohol Poisonings, both sexes, all ages
Russia, SDR 1991, Accidental Alcohol Poisonings, both sexes, all ages
Russia, SDR 1992, Accidental Alcohol Poisonings, both sexes, all ages
Russia, SDR 1993, Accidental Alcohol Poisonings, both sexes, all ages
Russia, SDR 1994, Accidental Alcohol Poisonings, both sexes, all ages
Russia, SDR 1995, Accidental Alcohol Poisonings, both sexes, all ages
Russia, SDR 1996, Accidental Alcohol Poisonings, both sexes, all ages
Russia, SDR 1997, Accidental Alcohol Poisonings, both sexes, all ages
Russia, SDR 1998, Accidental Alcohol Poisonings, both sexes, all ages

SDR per 100 000
- <10.1
- 10.1 - 20.0
- 20.1 - 30.0
- 30.1 - 40.0
- 40.1 - 50.0
- 50.1 - 60.0
- >60.0
Russia, SDR 1999, Accidental Alcohol Poisonings, both sexes, all ages
Russia, SDR 2000, Accidental Alcohol Poisonings, both sexes, all ages