The socioeconomic aetiology of suicide mortality in Russia

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Abstract: Large-scale abrupt socioeconomic changes are often associated with unsustainable conditions in terms of populations' health. An epidemic increase in suicide death rates has been recorded in Russia during the turbulent period of the socioeconomic transition. The socioeconomic aetiology of suicide mortality has been analysed for a large set of Russian regions. Suicide rates were statistically accounted for by the 'transition-related stressors' – hyperinflation, severe economic depression, etc. Deficiency of coping resources – lacking economic activities of the regional populations – turned out to be the strongest explanatory variable. Heavy binge drinking was a significant, but not the leading mortality predictor. The study results support the idea that sustainable socioeconomic development is crucial for the prevention of stress-related mortality.

Keywords: suicide; stress; socioeconomic transition; heavy binge drinking; sustainable development; panel data analysis; Russian Federation.

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1 Introduction

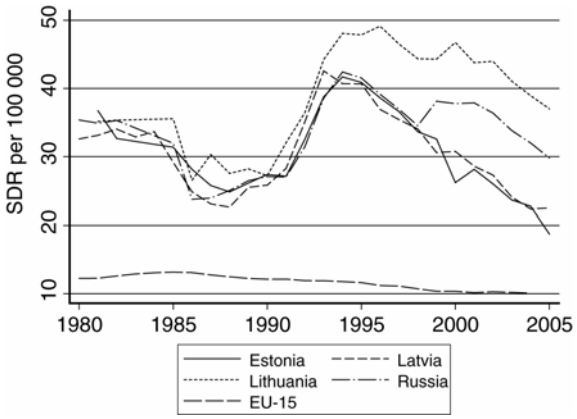
The issue of mortality crisis in the former socialist countries of Europe is well described in the research literature (Cornia and Paniccià, 2000, pp.3–37). In particular, the crisis expressed itself in sharp fluctuations of suicide mortality observed in some of the Post-Soviet states in 1990s. During the turbulent period of the socioeconomic transition, the highest levels of suicide mortality have been recorded in the Baltic countries – especially in Lithuania – and in Russia. There is an enormous gap between suicide mortality rates (SDR[1] per 100,000 inhabitants) in these states and the average level of the 15 'old' Member States of the European Union (Figure 1). Despite the apparent positive trends revealed in the last years, suicide rates are still high; in Lithuania and Russia exceeding the levels of 1990.

As an individual-level phenomenon, suicide denotes poor mental health, psychological problems and inharmonious, impaired personal development. Suicide prevention is to be envisioned in the spirit of the Rio Declaration on Environment and Development which states that 'Human beings are at the centre of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature' (United Nations, 1992).

Our focus on suicide mortality is a reflection of the idea that a major improvement in this indicator of populations' mental health and psychological (un)well-being must be regarded as one of the important endpoints of sustainable development, particularly for the countries with elevated suicide death rates.

In the Russian Federation, suicides and intentional self-harm bring about considerable losses of human lives since at least early 1970s (Meslé et al., 1996). In 1994, at the peak of mortality, 61,886 men and women died from suicide (WHO HFA-MDB, 2007). Annually, a population equivalent to a town is being lost to suicide.

Figure 1 Suicide mortality – Baltic countries, Russia and the 'old' EU Member States (EU-15), both sexes



Source: WHO, HFA-MDB (2007).

Though no attempts were made to estimate the economic burden of suicide mortality in Russia, huge costs are to be assumed. Studies from other countries can probably give some impression of the scale of suicide-related costs, even if direct extrapolations are questionable. In the US, where the incidence number of fatal self-inflicted injuries is nearly twice as low as in Russia, the estimated total costs for 2000 were $ 30.4 billion, with the waste majority due to productivity losses (Corso et al., 2007).

Suicide is one of the main causes of premature mortality in Russia, adversely affecting life expectancy. If this cause of death could have been eliminated, male and female life expectancy at birth would have been more than one year longer in 1990–2001 (FAIRS, 2002).

In the last four decades, the trends in Russian suicide mortality were basically parallel by important economic, societal and political events. The country experienced three markedly different historical periods:

1 the enduring economic stagnation
2 democratisation and the initial economic reformation of the Soviet state under the leadership of Gorbachev
3 the dissolution of the Soviet Union and the transition from planned socialist to market economy associated with painful socioeconomic reforms.

- During the period of stagnation, suicide mortality rates increased from 1965 to 1984, both in the Soviet Union and in Russia (Gilinskiy and Rumyantseva, 1997; Pridemore and Spivak, 2003; Shkolnikov et al., 1998; Värnik and Wasserman, 1992). In 1980, suicide death rate in Russia was about the same as in Hungary, that is, one of the highest worldwide (Meslé et al., 1996). As cited by Pridemore and Spivak (2003) Russian mortality rates varied from around 22 per 100,000 residents in 1965 to 38 per 100,000 in 1984.
- A significant mortality decline of nearly 40% occurred in 1985–1986, in the optimistic time of social democratisation and strict alcohol control, introduced by Gorbachev's government (Pridemore and Spivak, 2003; Värnik and Wasserman, 1992). The rates began to rise again in 1988, more or less simultaneous with the economic and political difficulties of *perestroika*.

- Dramatic fluctuations of suicide death rates marked the period of the major transition-related reforms, which started with the price liberalisation in 1992 (Figure 1).

The coincidence between suicide mortality trends and the phases of the country's recent history suggests that suicide behaviour should be analysed not as an individual phenomenon, but in relation to the socioeconomic context.

The upsurge in mortality over 1990s – unprecedented in the world during peacetime (Ryan, 1995) – is unlikely to be explained by an inaccuracy of national statistical data or problems in reporting procedures (Andreev, 1999, pp.262–283; Leon et al., 1997; Notzon et al., 1998). Therefore, data validity is not an obstacle for analysing suicide rates. One important exception relates to some administrative areas of the North Caucasus, in which data are less reliable or incomplete – for instance, Chechen and Ingush Republics (Anderson and Silver, 1997, pp.120–156).

In the previous research, considerable efforts have been made to scrutinise spatial patterns and temporal trends in Russian suicide mortality (Pridemore and Spivak, 2003; Shkolnikov et al., 1998; Vallin et al., 2005; Värnik and Wasserman, 1992; Wasserman et al., 1998) and to grasp the very nature of the phenomenon (Bobak and Marmot, 1996; Cornia, 2000, pp.59–82; Kingkade and Arriaga, 1997, pp.156–183; Shapiro, 1995, pp.149–178; Stone, 2000; Walberg et al., 1998).

So far, the hypotheses prevailing in the literatures ascribe the crucial role in high Russian suicide mortality to:

1 Socioeconomic and political problems of the stagnation era (Gilinskiy and Afanas'ev, 1993); dissatisfaction of the population resulting from material and psychosocial deprivations of the stagnation period (Bobak and Marmot, 1996).

2 Psychosocial stress due to large unanticipated changes of the transition period in the absence of effective coping behaviours (Cornia, 2000; Shapiro, 1995).

3 Independent effects of transition-related changes such as societal deregulation and disintegration, crisis of norms and values, macroeconomic instability, negative labour market trends, increasing inequality (Berkman et al., 2000; Brainerd, 2001; Mäkinen, 2000; Orlova, 1998).

4 Pathologically high levels of alcohol consumption, dangerous drinking habits – that is, binge drinking and preference of strong beverages (Nemtsov, 2003; Pridemore, 2006).

Despite the diversity of opinions and theoretical orientations, the leading hypotheses seem to agree in one essential point: high suicide mortality is a consequence of forces – economic, societal and cultural – which are deeply routed in the country's historical development.

The dramatic experience of Russia in the last few decades allows us to assume that increasing suicide mortality may be used as a sensible indicator for the lack of sustainability in the socioeconomic development. High national suicide rates may testify to a deep economic and social stagnation or to a large-scale economic shock associated with a massive social disruption and disintegration. These conditions are incompatible with the idea of a sustainable socioeconomic development.

In the broader context, the debates on human happiness and its linkage to sustainable economic growth and societal well-being represent two principal standpoints, namely, the crucial importance of economic growth versus the intrinsic significance of social integration, cultural and social ties, for health and emotional well-being.

It has been a standard economic policy in all international economic organisations and virtually all national governments to promote the growth of the economy. It appears that societies will be prepared to sacrifice almost anything to achieve higher levels of economic growth. Countries are routinely judged by standards of economic productivity and material well-being. Additionally, economic growth and development are central concerns of professional economists and much economic theorising and considerable empirical work is routinely devoted to the analysis of policies and factors that would enhance economic development.

Certainly, since the Scottish and French enlightenments with their emphasis on the development of science and technology as the basis for human material well-being, it has also been a standard of sociological theory, especially 'modernisation' theory to envision economic development as the fundamental basis of social and moral development of the human species.

At least one major theoretical orientation has developed an antithetical position to this general theme of the unquestioned benefit of development. This is the evolutionary theory of Emil Durkheim, one of the fathers of modern sociology, writing in the latter part of the 19th century. In contrast to the utilitarians who influenced Adam Smith and John Stewart Mill, Durkheim felt that economic prosperity would not necessarily increase human happiness. Indeed, according to Durkheim, happiness was not achievable as a result of the satisfaction of basic human material needs and desires. Rather, in Durkheim's view, it was 'spiritual' and socio-cultural phenomena, strongly associated with social solidarity and integration which lay at the heart of a happy 'mental state.' Durkheim believed that human happiness depended upon an embeddedness of the person within cultural norms and values and within social relationships. It was the regulatory power of the norms of cultural life and social relations which gave structure and meaning to peoples' lives. It was therefore under conditions of 'anomie' – a breakdown in normative control – which allowed human emotions or 'passions' to go beyond what was healthy for individual persons (Durkheim, 1897).

Durkheim (1893), Henry Sumner Maine (1861) and Ferdinand Tönnies (1887) elaborated the elements of a sociology that viewed the development of urban life as involving new forms of human social relationships which would alter the nature of cultural life, emotional ties, and, therefore, of actual happiness. The change was basically one which depicted a move from largely familistic to social relations in agricultural village life to the interactions of different populations, ethnic groups, religions and even nationalities within the market-oriented setting of urban, cosmopolitan employment and residential life. In the village setting with rather small, frequently kin-related clusters of people, virtually all individuals would know one another well, usually over entire lifetimes. In contrast, the urban setting was a meeting place of people brought together either for purposes of employment in production or of buying and selling. Social relations under conventional urban culture would stereotypically involve the meeting of people whose primary relationships with each other were short-lived and related to economic exchange. In both production processes and exchange, people were bound to each other by the sense of legal or verbal contract and their relations were dominated by the need to secure goods or services from other people in exchange for those they were able to offer.

While the prototypical forms of rural village life linked people by the nature of the similarity of their culture, work life and family relations, the reverse was understood to hold true for those living under an urban regime. The essence of the urban social relations 'contract' was that it was founded on differences of peoples' abilities, contributions and skills rather than similarities. In Durkheim's view, for example, this village-urban continuum in social relations can therefore be typified by two fundamental types of human social relation. In the village case, Durkheim utilised the term 'mechanical solidarity,' while in the urban situation, his theoretical concept was 'organic solidarity'. In the mechanical case, peoples' social relations depended on the coherence and homogeneity of cultural norms and values, whereas in the urban situation they depended on the norms of what very different people could bring to one another.

In the final analysis, Durkheim appears to have believed that the long-term urbanisation and industrialisation of life would produce a lower level of human happiness, despite its greater material well-being. This long-term loss of happiness depended on a loss of the type of mechanical social integration that depended on a mutual respect for and deep embeddedness in the culture of one's birth. The loss of that self-regulated culture, which provided a place and meaning of life, would gradually be dissipated in the movement toward the freer, more highly individualistic, intellectually innovative and culturally disruptive life of the city. In the long term, therefore, despite material improvements in human well-being, the move toward an urbanised lifestyle, with its intellectual openness and destruction of cultural authority, would bring people to the potential of highly anomic states of mind. Basically, the cultural, intellectual and economic freedom afforded persons through economic development and urbanisation could therefore, actually dissolve the potential for their sense of happiness and contentment with life.

This long-term theme of the dissolution of the cultural basis for social integration and human happiness is one of the strands underlying Durkheim's theory of suicide. The other strand theoretically related to breakdown of culturally based integration is the potential for anomie – that is, behaviour and mental states outside the usual regulated pattern of norms – would occur as a result of rapid social changes which would further disorient the individual who, already of an individualistic frame of mind, would be prone to erratic behaviour, either destructive of the self or of other persons.

Durkheim's themes of loss of social integration and anomic behaviour, based on fragmented culture and weak social relationships, has been a major theme in social epidemiology of suicide, mental disorder and chronic disease for many decades. A large literature has developed essentially confirming the general theme that social and cultural ties are of intrinsic importance to emotional well-being and thus, through psychophysiological mechanisms, to physical health as well.

A repercussion of these themes can be found in the contemporary research. Modernisation – combining the socio-structural aspects (urbanisation, industrialisation and the new ways of life) with cultural changes (secularisation, individualisation, as well as their effects on modes of thought, individual actions and social relations) – appears to be the most likely explanation for the changing spatial patterns of suicide mortality in the Eastern Europe before and at the end of the 'Communist period'. The large increase in suicide rates was probably aggravated by the lateness and ensuing abruptness of the modernisation process (Mäkinen, 2006).

With this literature on social integration in mind, it seems useful to propose that a major source of the sustainability of economic development would be that it does not lead to the weakening of cultural and social ties to the extent that the suicide rate could indeed be elevated.

In the following subchapters we will review the most important hypotheses and research results. Further, we will introduce the results of our study on the socioeconomic aetiology of suicide mortality in the regions of Russia in transition.

1.1 Economic stagnation/decline and suicide

Little is known about the causes of increased suicide mortality in the prime of the Soviet 'stability' of 1970s and 1980s – the period termed as economic stagnation. Some scholars suggest this cause to be related to the failure of the political and economic system to satisfy both material and psychosocial needs of the population (Bobak and Marmot, 1996).

Indeed, the Soviet 'administrative command economic system' had crucial limitations. The demand structure of the economy favoured selected priority branches, which included first of all heavy – especially defence – industry, metallurgy, machine building and electricity. Others had been deliberately underrepresented in the Soviet Union, such as light industry, service and transportation. The shortage of consumer goods was disproportional in relation to wages; service branch was poorly developed. Planners' preferences, dictated through the planning hierarchy, replaced consumer preferences. The whole system was based on virtually complete nationalisation of business, state control of almost all prices in the economy, state monopoly in foreign trade and a complex bureaucracy. Resource allocation was directed in a centralised fashion through a planning apparatus, controlled by the Communist Party, which set objectives for economic development (Gregory and Stuart, 1998, pp. 3–20).

Since 1970s, these conditions were associated with an apparent slowdown in the country's economic growth. Maddison (2001) names three reasons for this slowdown, particularly:

1 a decrease in microeconomic efficiency

2 the increased burden of military expenditures and diversion from industrial and consumer investments

3 depletion and destruction of natural resource advantages.

Most important, Maddison (2001, p.155) reports that 'Work incentives were poor; malingering on the job was common place. The low wages which the system offered had a dulling effect on work incentives'. "The quality of consumer goods was poor. Retail outlets and service industries were few. Prices bore little relation to cost. Bread, butter and housing were heavily subsidised. Consumers wasted time queuing, bartering or sometimes bribing their way to the goods and services they wanted. There was an active black market and special shops for the *nomenklatura* [communist party officials]. There was increasing cynicism, frustration, growing alcoholism and a decline in life expectation".

Rising suicide mortality in the 'close atmosphere of economic, political and social stagnation' (Gilinskiy and Rumyantseva, 1997) has been interpreted as an indication of 'degradation in social and economic life' (Gilinskiy and Afanas'ev, 1993), resulting for

individuals in difficulties in the unfolding of self. Unfortunately, no empirical work with Russian data has been done to statistically explain the relationships between the economic indicators and suicide mortality rates in stagnation.

Brenner (2003) developed time-series models for Russia, Hungary and Poland to examine the relationships between the state of macroeconomy and mortality due to cardiovascular diseases and all causes of death over the period 1970–1998. In all three countries, a significant effect of real GDP per capita on mortality has been found.

For the Western industrialised countries, the continuing downward trend in mortality has been shown to correspond to continuing economic growth trends (Brenner, 1979, 1990, 1995, 2005).

In fact, suicide rates are especially vulnerable to economic recessions. They are so sensitive to declines in employment rates and increases in unemployment rates that they virtually constitute an 'economic indicator' which is almost as reliable as any major business cycle indicator. Among the early indications that mental disorder in general and depression in particular (a principal predictor of the suicide rates) as closely related to declines in employment is the original work by Brenner (1973) indicating that mental hospital admissions in the state of New York are consistently and inversely related to the employment rate in that state over the entire period 1841–1967.

This was followed by studies of the relation between national economic changes represented by real per capita income, as well as the unemployment rate, as related to suicide rates in the entire US over the period 1936–1973 (Brenner, 1975) as well as over the periods 1945–1984 (Brenner, 1984). These analyses were contained in two studies for the US Congress Joint Economic Committee. Once again, suicide rates, certainly in the US, were observed to be closely linked to periods of economic recession or stagnant economic growth. Subsequent studies in Western Europe, as well as among Eastern European countries, confirm these results when one looks at cross-sectional comparisons of countries both within the Western European and Eastern European regions. This has been observed in time-series analyses as well as including analyses for overall mortality rates in the Russian Federation.

The conclusion is, therefore, that the departure and elevation of mortality rate trends in Eastern Europe and the USSR, from those in Western industrialised societies reflects a stagnation of economic growth in the latter countries since at least 1973.

1.2 Shock of the socioeconomic transition, psychosocial stress and suicide

Increasing suicide mortality has been observed in times of abrupt economic, societal and cultural changes. The theoretical origin of this idea can be traced to the classic study of Émile Durkheim on suicide (1897). In Durkheim's understanding, rapid changes in the social order potentially produce a breakdown of moral norms or anomie, in which society fails to rein in aspirations of individuals and to guide their behaviour. In essence, an individual gets lost in a void of meaninglessness. This state is assumed to be the reverse of social integration and the cause of incessantly recurrent conflicts. Societal disintegration is intrinsically linked with alienation and loneliness, unhappiness and suffering and, therefore, with anomic suicide. As argued by Durkheim, this form of suicide can be observed in times of both economic depression and prosperity.

However, suicide does not directly result from poverty or prosperity – rather it is the outcome of social instability brought about by rapid social changes (p.247):

> "If …industrial or financial crises increase suicides, this is not because they cause poverty, since crises of prosperity have the same result; it is because they are crises; that is, disturbances of the collective order… Whenever serious readjustments take place in the social order, whether or not due to sudden growth or an unexpected catastrophe, men are more inclined to self-destruction."

Durkheim's emphasis on the negative consequences of abrupt social and economic change is widely supported by later research. Lack of stability and *normlessness* are closely related to destructive psychological conditions, which are believed to be the basis of deviant behaviours. Conversely, conformity with the social order (Merton, 1968, p.195) is the most likely individual adaptation to a stable society, in which culturally prescribed goals are in agreement with socially imposed norms of behaviour. In the case of Russia, not just deregulation of desires and norms can be important in explaining heightened levels of deviance, but also the redistribution or removal of opportunities and the frustration that ensues (Pridemore and Kim, 2007).

The past decade's crises in Russia and other transition countries are thought to be classical situations leading to anomic suicide (Berkman et al., 2000). Modern Russian sociologists regard anomie as the most dangerous malady, incompatible with a forward movement of a society; anomie might unnoticeably but effectively destroy any constructive programme of socioeconomic transformation. On the surface of social life anomie manifests itself as a sharp increase in deviant behaviours – disrespect of legislation, massive expansion of crime and violence, increase in suicide numbers, supremacy of 'group egoism' (sic) and indifference, as well as damage to the succession between generations (Pokrovskiy, 2000).

In the countries with the established market economies, anomie is cited as a major factor in the rising rates of suicide in specific populations – for example, western adolescents and aboriginal peoples of America and Australia (Spencer, 1997). The rapid sociocultural change is discussed in relation to growing suicide rates in Greenland (Leineweber et al., 2001) and Pacific Islands (Booth, 1999).

For the countries which experienced the transition from planned socialist to market economies, researchers attempted to explain the aggregate-level tendency towards suicide in line with Durkheimian theory – for example, by the change in itself in the sense of its being anomic (Jarosz, 1998), by alterations in values and lifestyles (Wasserman and Värnik, 1994), by anomie as a crisis of norms and values (Orlova, 1998).

Indeed, the process of transition has been characterised by profound changes in virtually all important life spheres. While the scale of socio-economic, political and ideological transformations has been assumed to have tremendously influenced the moral constitution of the society and the contingent of voluntary deaths, the effects of the major forces have not been explicitly tested in relation to Russian aggregate-level suicide mortality. Initial work of this sort has begun, mostly involving data for several countries, but also including Russia.

For the group of 27 former East Block states, Mäkinen (2000) examined the impact of the transition process on suicide mortality. The 'best fitting' regression model has been obtained with a combination of changes in life expectancy, which was assumed to approximate the 'general pathogenic social stress', alcohol consumption,

'democratisation' and homicide, while 'economic development seemed to exert less influence on suicide rates than has been expected'.

Brainerd (2001) performed fixed effects regressions across 22 transition economies. The results indicated a high sensitivity of male suicide rates to the state of the macroeconomy, measured, in particular, by GNP per capita and the employment-to-population ratio. In contrast, female suicide rates were insensitive to the state of the macroeconomy, but more strongly related to alcohol consumption.

In pertaining to the negative effects of transition, studies on broader health conditions deserve attention as well. Specifically for the regions of European Russia, Walberg and colleagues (1998) found that the fall in male life expectancy at birth was most closely correlated with labour turnover – a proxy-measure of transition or labour market shock. The impact of the acute socioeconomic transition has been largely exacerbated by a lack of civic cohesion, approximated in this study by crime. The authors suggested a theoretical model linking abrupt economic change with ill health or death, in which an important role belongs to decreasing cohesion/increasing inequality and psychosocial stress. Stress can affect health directly or via behavioural changes, most notably by alcohol consumption in the case of Russia.

The regression analyses of Shkolnikov and Cornia (2000) were aimed at capturing an impact of 'changes in socioeconomic conditions' on male life expectancy in 47 European regions of Russia. Again, labour turnover showed the strongest relative contribution in the prediction of the dependent variable.

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

Another example of a 'stress index' has been illustrated in the research paper of Cornia and Paniccià (1996). The authors regressed crude death rates for 13 transition countries (1989/1994) on a stress index summarising the impact of rising unemployment and inflation, and on the index of real health expenditures per capita. The 'psychosocial stress' index 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 macroregions 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 a typical situation of the Caucasus regions. The 'psychosocial stress' explained the greatest part of the variance of the dependent variable.

To further test the stress hypothesis, Cornia (2000) carried out regression analyses with more disaggregated regional data, including 47–50 *oblasts* (administrative areas) of European Russia and 17 Siberian regions. As dependent variables, 1989/1994 changes in standardised death rates have been used for the population aged 14–60 due to all causes, violent deaths and cardiovascular diseases. Labour turnover – measured as a sum of the 1994 quit ratio and new hire ratio per 100 workers – was included as one of the explanatory variables. In addition, data on labour turnover have been used for the

construction of the 'psychosocial stress' indicator. The 'psychosocial stress' index explained the greatest part of the overall variance in mortality for the European regions of Russia. Its impact was about 2.5 times higher in men than in women. In the case of external mortality, crime played an equivalent role.

The author found a northern-southern mortality gradient, with the *oblasts* of Eastern Siberia particularly affected by mortality increased. Cornia assumed that the extent, speed and impact of the economic restructuring play the key role in the regional patterns of mortality changes, since the Russian regions of the 'northern belt' experienced greater than average increases 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.

In the studies discussed, 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 difficult to clearly interpret:

- Labour turnover may be attributed to the changes in the economic structure.
- It can reflect labour market tensions, resulting from transition-related restructuring of enterprises – that is, 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 may not be meaningful. When privatisation of state enterprises takes place, personnel departments formally registered mass discharges and hiring of employees. People actually remained 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.

On the other hand, it is difficult to disagree that these factors can jointly produce an enormous increase of stress levels in the population. Additional problems, associated with these conditions – like widening income inequality, loss of 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 levels – may significantly contribute to further distress.

The basic argument in support of the stress hypothesis refers to conditions when distress – as a pathological process associated with bodily reactions to external forces – disturbs an organism's homeostasis. Namely, the large-scale unanticipated transition-related changes caused people to perceive great uncertainty about their future, lack of control over the most important areas in their lives (Anderson, 1997) and 'a discrepancy – whether real or not – between the demands of the situation and resources of the person's biological, psychological or social systems', that is, stress (Sarafino, 1994, cited in Cornia, 2000, p. 66).

Further, there is abundant evidence that stress – via direct pathophysiological mechanisms (Algra et al., 1993; Anda et al., 1993; Brunner, 1997; Vale, 2005) or through 'unhealthy behaviours', for example, excessive consumption of alcohol and tobacco or drug addiction (Stewart, 2003; Suwaki et al., 2001; Walter et al., 2005) – is linked with mortality increase from violent causes, cardiovascular diseases, etc. (McKee and Shkolnikov, 2001).

In principle, the stress hypothesis appears to be biologically very plausible. However, due to substantial difficulties in the identification of valid measurements of transition-related stress, the epidemic outbreak of suicide mortality remains largely unexplained. The terms 'transition' and 'stress' are used loosely and interchangeably, and the pathways linking macrolevel economic shocks and suicide mortality are far from being adequately studied.

Some insight into these pathways can be provided by the examination of age and gender patterns in suicide death rates. In 1990, the highest death rates have been observed in the oldest population groups. By 1994, mortality rose in nearly all age groups, except older women of 70 years and over. The steepest increase has been recorded in men of working ages. The excess male mortality changed male-to-female death ratio from 4.5 in 1990 to 6.1 in 1994, measured as SDR relation for all age groups.

The excessive suicide mortality among working-age men has been interpreted in two ways. The first explanation concerns the increased psychological vulnerability of men due to an imbalance between the performance of 'standard' gender roles and the new economic reality. During the Soviet era, traditional breadwinner-homemaker roles for men and women were promoted, despite theoretically ideological equality between the genders (Anderson, 1997). As a result, working-age men would be more severely harmed in times of economic shock by losses of labour market chances, income opportunities and occupational status achievements. The emotional pain of an identity crisis is illustrated by the quotation: "What is a man – a husband – worth, who feels unable to feed his family alone by his labour? If he is a real man, he will develop a complex of inferiority" (Lisichkin, 1999).

These considerations are consistent with the escape theory of Baumeister (1990), according to which suicide may arise either because standards are unrealistically high or because events are unusually bad, or both.

Despite generally poorer chances in the labour market, women were better protected from stressful experiences: They counted on a more diversified portfolio of activities and social relations which shelter them from anxiety and dejection (Cornia, 2002, pp. 32–54).

The second explanation of the excess suicide mortality in working-age males brings the alcohol hypothesis to the forefront. The main argument in support of this assumption is the coincidence in time between the Soviet antialcohol campaign of 1985–1987 and the drastic reduction in suicide mortality. In the subsequent years, alcohol consumption progressed in line with the mortality trends, as estimated by Nemtsov (2005). That is, alcohol consumption returned to its 'preGorbachev' level by 1991–1992; then it continued to grow until 1994; the subsequent decline was followed by a new increase since 1998.

Strong beverages including moonshine comprise over 70% of the alcohol consumed in the country (Andrienko and Nemtsov, 2006). There are highly tolerant attitudes towards drinking of strong beverages in relatively large amounts. Nearly one-third of Russian men may drink a glass of vodka or more at one 'occasion' at least once per month (Bobak et al., 1999).

Finally, two papers utilising time-series analysis found a positive and significant association of proxy-measures for heavy drinking and suicide mortality (Nemtsov, 2003; Pridemore, 2006). However, none of the potential modifiers for 'heavy drinking' had been taken into account in these studies.

The key point in debates on alcohol and suicide relates to the causes of increased alcohol consumption. A full discussion of this point is beyond the scope of this paper. However, in brief, there is good reason to believe that alcohol is often used as self-medication for stress-related discomfort. Longitudinal epidemiological studies support a causal relation between stress and subsequent alcohol use and even heavy drinking (Hill and Angel, 2005; Russell et al., 1999).

A comprehensive examination of adverse macrolevel conditions may play an essential part in generating hypotheses that can explain the potential causes of both suicide and heavy alcohol consumption. One must consider that powerful social and economic forces exist at the population level, and it is increasingly recognised that traditional risk factors cannot, by themselves, sufficiently explain mortality variation in countries having a deep socioeconomic transition (Pearce, 2000; Weidner and Cain, 2003).

2 Suicide in the Russian transition: regional conditions, descriptive approach

The overarching research aim of our study was to clarify the macrolevel aetiology of suicide mortality 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 conceptual frameworks for studying the determinants of suicide mortality

3 identification of appropriate proxy measures which can be used to represent the idiosyncratic situation of transitional Russia

4 testing the validity of the conceptual frameworks using regional panel data.

The study combines a variety of approaches. With the descriptive approach, clusters of high- and low-mortality regions were identified. Figure 2 shows a map of Russian administrative areas – referred to as regions in this paper – shaded light to dark in accordance with the level of suicide mortality. The grouping is based on the analysis of region-specific suicide death rates, age-standardised by the European population (SDR per 100,000 residents). Annual SDRs have been derived from the original database 'Factographic Automated Information Reference System (FAIRS) Potential' (FAIRS, 2002), which comprises regional data on mortality and population from the official state statistics sources (GOSKOMSTAT).

Figure 2 Suicide, clusters of high-, middle- and low-mortality areas

The Russian Federation contains 89 administrative areas. For the great majority of areas ($N = 77$) the grouping in clusters is based on the SDR data for 1990–2001 (for technical details, see Andreeva, 2006). For 10 regions data were only available for 1997–2001 or 2000–2001[2]. Further, two regions – Chechen and Ingush Republics – were excluded due to non-reliable or missing data.

In order to explain 'high', 'medium' and 'low' suicide mortality rates we have carefully reviewed statistical approaches based on official data (GOSKOMSTAT, 2000, 2002), as well as multiple publications textbooks, reference books and studies on regional economics and the social situation (Gokhberg, 2002; Granberg, 2004; Lagutenko, 2001; TACIS, 1996; Weißenburger, 1995; Zubarevich, 2000). These publications 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, the labour market situation, etc.

Here we summarise the most important results. For the whole country, the transition to market economy caused alterations in the economic structure, that is, 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, overall industrial production declined by 49%, while for machine building this decrease amounted to 56% (GOSKOMSTAT, 2000, pp.17–62). After the foreign trade liberalisation, the Russian light and food industry failed to compete with imported goods and experienced a production collapse, comparable to that in heavy industry.

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.

The magnitude of the general economic crisis was different across regions, depending on their pretransitional economic structure, presence or absence of a specialisation in the crisis-affected branches, particularly, in heavy industry (defence) or light and food industry. Similarly, regions experienced different degree of suicide mortality 'epidemics'.

In sum, virtually all areas within the *high-suicide zone* had unfavourable socioeconomic conditions in transition. The 'problem regions' (Granberg, 2004, pp.317–344) with high suicide levels are subdivided into four groups.

1 'Retarded regions' are characterised by initially poor economic development, less diversified economic structure, weak social sphere and low scientific and technological potential. During the transition, they had lower than the country's average living standards of the population, higher than average unemployment rates and – in some regions – extremely long arrears in wage payments.

   Examples: Republic of Tuva and Chita region within the Eastern Siberian economic region, Republic of Altai (Western Siberian economic region), Republic of Mariy El (Volga-Vyatka), autonomous districts (*okruga*) Koryakskii (Far East), Komi-Permyatskii (Ural), Aginskii Buryatskii, Ust'-Ordynskii Buryatskii (Eastern Siberia).

2 'Depressed regions' differ from the previous group by high economic development indicators prior to the transition. As a rule, they had a large share of industrial production and a significant proportion of highly skilled industrial labour force. For the most part, depressed regions included old-industrialised and urbanised areas with a pretransitional preponderance of light and machine building/defence industries or coal mining; these branches were severely hit by the economic crisis of the 1990s. These regions suffered a considerable production downswing and high unemployment. During the transition period, there were relatively small changes in the regional economic structures. Depression in the agrarian sector aggravated economic difficulties in the regions with a relatively large rural population. It is important to bear in mind that suicide is a predominantly rural phenomenon in Russia.

   Examples: Ivanovo and Vladimir regions (Central economic region), Pskov region (North-West), Arkhangelsk region (North), Chuvash Republic and Kirov region (Volga-Vyatka), Chelyabinsk and Kurgan regions and Udmurt Republic (Ural), Altai territory (Western Siberian economic region), Chita region and Republic of Buryatia (Eastern Siberia), Amur region, Jewish autonomous district and Khabarovsk territory (Far East economic region).

3 The 'Northern zone' is characterised by severe climatic conditions, remoteness from the major centres of cultural and economic life and generally higher costs of transportation, living and production. The cold climate requires greater investments in social infrastructure, industry, railway and roads system, everyday amenities and health services. Agricultural activities and personal subsidiary plots/holdings are ineffective; the foodstuff requirements of the population can only be covered by imported products. 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, p. 112). Regions with a severe climate were particularly affected by the hyperinflation. Some of the regions went through the transition from relative wealth of the Soviet times to large-scale poverty and experienced a massive migration outflow. The northern areas of European Russia are similar to the depressed old-industrialised regions with respect to high unemployment; however, the production fall affected different industrial sectors. In the Asian part, the problems of northern areas demonstrate much similarity with those of the 'retarded' regions.

Examples: Republics of Karelia and Komi, Nenetskii autonomous district (North), Irkutsk region, Krasnoyarsk territory, autonomous districts Taimyrskii (Dolgano-Nenetskii) and Evenkiiskii (Eastern Siberia), Sakhalin region and autonomous districts Koryakskii and Chukotskii (Far East).

4 Frontier regions had specific challenges of high cross-border smuggling traffic, drastic downsizing of military contingent and dramatic decline in living standards of military service employees.

Examples: Kaliningrad and Sakhalin regions

We identified some '*good*' *provinces* of the European South with low suicide death rates. These provinces can be subdivided into two distinct groups: poor ethnic republics of the North Caucasus and relatively wealthy Russian-dominated southern *oblasts* 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 pretransitional economic structure was mostly 'favourable'. Thus, Belgorod and Lipetsk *oblasts* 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 in the regional economic structure
- low unemployment rates
- beneficial climatic conditions for effective agricultural activities, for instance, personal subsidiary plots/holdings
- high or middle-high real available income of the population (Granberg, 2004, p.280).

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 – for example, Kabardian-Balkar, Karachaev-Circassian, North Osetia and Dagestan – are regarded by economists as 'retarded' or 'less developed'. The large proportion of non-Slavic ethnic groups seems to correspond with generally negative attitudes towards heavy binge drinking in the population.

Apart from negative attitudes to 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 multigeneration 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 a living remain strongly bonded to the core households.

The distinctive features of the republics' regional environment are:

- relatively low degree of urbanisation
- 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
- extremely low real available income of the population.

The 'less developed' ethnic republics of the North Caucasus represent the most anomalous group of Russian regions. Their low and stable suicide mortality rates – despite enormous poverty of the inhabitants, political instability, ethnic conflicts, etc. – suggest, perhaps, that some of the mortality data may not be reliable for these provinces. On the other hand, the 'ethnic factor' may have protective effects on mortality.

The major cities – Moscow and St. Petersburg – also exhibit low suicide death rates. During the period analysed, the two cities experienced a considerable change in their economic structure, that is, substantial increases in the shares of trade, financial services and personal services – all of which are in greater demand in a market economy. The diversification of the initial economic structure contributed to a successful adaptation to the economic crisis and to the decline of machine building/defence industry. In Moscow, there was a significant decline of industrial output during the initial transition (1992–1995), whereas construction, services, governmental sector and banking/financial sector developed rapidly. The real available income of the population was high as compared to the Russian average. Low officially registered unemployment and relatively low 'hidden unemployment' characterised the labour market situation.

Based on the descriptive evidence, a tentative conclusion can be made that a variety of regional conditions seem to be responsible for differences in the area levels of suicide mortality. The unfavourable conditions refer to the pretransitional preponderance of industries severely affected by the economic crisis of the 1990s, the relatively high share of agricultural production in the areas' economy, the higher unemployment and inflation rates, a significant decline in the populations' living standards, as well as severe climate.

In addition to these factors, a statistical analysis of regional suicide mortality should include proxy-variables for heavy binge drinking, the proportion of ethnic groups with stronger norms of solidarity, social cohesion and support, in addition to a proxy-measure for social tension, distrust and hostility. Further, an appropriate statistical model should take into account 'survival strategies' of the population, which were used to overcome the economic hardships over the unstable period of the socioeconomic transition.

3 Determinants of suicide mortality: conceptual framework and indicators

To deal with suicide as a stress-related cause of death in a systematic way, a new conceptual framework is proposed for a targeted selection of measurable mortality predictors. It appeals to classical stress theory in the biomedical and psychological understanding. In essence, any adjustment of humans to rapidly changing conditions implicates an unspecific stress reaction. Hans Selye (1985) envisioned stress as a phase-wise sequence of neuroendocrine reactions, finally leading to exhaustion, when the body's energy reserves waste away, fight becomes impossible, and the behaviour is characterised by passivity and 'escape'. The extensive review of medical and epidemiological literature resulted in the assumption that non-impulsive suicide manifests in exhaustion, when fatigue, hopelessness and lack of motivation considerably disrupt quality of life.

Stressful changes may refer to radical alterations of living standards due to a transition-related socioeconomic instability.

Understanding the pathways of suicide manifestation leads to an assumption that non-impulsive suicide will be more prevalent in the areas where the populations will:

1 experience higher severity of stressors

2 have less coping resources to withstand stressors and their hazardous effects

3 be more susceptible to stress and exhaustion due to specific conditions of regional environment.

This assumption has been tested with Russian regional panel data. Annual Suicide Death Rates (SDR per 100,000 inhabitants, age-adjusted by the European population) have been taken from the original data basis FAIRS (2002).

Data on explanatory variables include demographic, social and economic indicators, as well as characteristics of regional climatic conditions. Except for climate variable, the data source is GOSKOMSTAT (2002). Data on regional climatic conditions have been derived from the Web Atlas Environment and Health of the Russian Population (2004), which provides an integral valuation of more than 30 parameters, including duration of high- and low-temperature seasons, air temperature amplitudes (yearly, monthly and daily), etc.

For the monetary-based independent variables, inflation adjustment due to Consumer Price Index (CPI) has been performed. The obtained values of variables in deflated roubles were transformed to natural logarithm. The logarithmic transformation has been used for coping with a highly skewed variable distribution, in order to stabilise the variance and to linearise the model. In accordance with the standard econometric practice, this procedure is justified, if a variable shows exponential growth – that is, prices during hyperinflation – or has a large 'right tail', which is the case for mean private savings per capita. The details on computation of variables and argumentation for the selection of mortality predictors are given elsewhere (Andreeva, 2006).

In sum, the identification of measurable mortality predictors required considerable efforts. Some of the indicators – particularly, those related to unemployment, crime, heavy binge drinking, climate – have been extensively studied in individual-level or ecological studies in relation to suicide. The rest of the variables approximate the

classical concepts of social epidemiology, which conventional measures can be seriously biased due to the effects of the informal (shadow) economy. Thus, private savings were used to substitute per capita income, etc. Explanatory variables are described in Table 1 in accordance with their roles hypothesised.

Table 1 Groups of explanatory variables, expected signs and associations

Variable	*Indicates the presence of:*	*Signs*
I. Core transition-related stressors		
ln(SAV) – mean private savings (SBERBANK) per capita	Financial losses of the population, material deprivation	–
ln(IND) – volume of industrial production per capita	Manufacturing crisis, hidden unemployment, background for economic passivity of the regional population	–
ln(AGR) – agricultural production per capita	Poor infrastructure for effective business activities (roads out of repair, low purchasing capacity of the population, etc.), background for economic passivity of the regional population, 'rural effects' (isolation, seasonal stress, easy access to firearm and dangerous compounds – e.g. pesticides)	+
ln(CPI) – Consumer Price Index (CPI 1991 = 1)	Unpredictable inflation development, risk of economic losses	+
CLIMATE – dummy-variable (0 = 'good climate'; 1 = 'bad climate')	Hardship of climatic conditions, arduous living conditions, elevated magnitude of transition-related problems	+
II. Coping strategies used by the population to overcome economic hardship		
ACCOUNT – number of private deposit accounts (SBERBANK) per capita	Legal and shadow economic activities of the population	–
III. Aggregate-level stress moderators closely linked to stress susceptibility of regional population		
CRIME – registered crime rate per 100,000	Social tension/disruption, distrust and hostility	+
ALC – accidental poisoning by alcohol, SDR per 100,000	Heavy binge drinking	+
MOSLEM – ethnic composition of the regional population	Proportion of ethnic groups with stronger norms of solidarity within households and neighbourhoods, social cohesion, social support	–
UNEMPL – numbers of unemployed per one vacancy	Unemployment, 'chances to get employed', loss of material resources, downward mobility in socio-economic status, increase in behavioural risk factors	+

The variable ACCOUNT represents coping strategies and deserves a special comment. A protective role of active problem-oriented coping has been consistently recognised for different age groups, national settings and various types of stressful life events (e.g. Kozora et al., 2005; Liu et al., 2004). To overcome economic hardships over the

transition period, the Russian population was forced to look for additional or substitutive income sources from both legal and shadow economic activities – multiple working places, odd jobs, small-scale informal business, etc. These 'survival strategies' have been discussed as an active, problem-oriented coping style (Gerry and Li, 2004; Lokshin and Yemtsov, 2001). In this study, number of private deposit accounts per capita has been used as a proxy for legal and shadow 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. 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.

A pooled cross-sectional time series analysis has been carried out with the software package STATA/SE 8.2 for Windows. Fixed and random effects models have been explored to explain suicide mortality levels in 77 regions of Russia. The final choice of the model (fixed versus random effects) is determined by the results of the Breusch and Pagan Lagrangian multiplier test for random effects and the Hausman test.

4 Results of panel data analysis

Table 2 'displays the best fitting' random effects model of suicide mortality, in which all coefficients are significant and demonstrate the expected signs.

The model indicates a good fit with the data, explaining about 75% 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.

In order to compare the relative importance of explanatory variables, elasticities at median have been computed. The exception is CLIMATE, for which the elasticity calculation was based on the variable's mean value.

For the logarithmically transformed variables, the elasticities have been specified in the form of:

$$d\left(lny\right)/d\left(x\right) \tag{1}$$

For the non-transformed variables, elasticities were computed as follows:

$$d\left(lny\right)/d\left(lnx\right) \tag{2}$$

Based on the absolute values of elasticities (Table 3) the explanatory variables are ranked as listed below. The variables are interpreted in accordance with their signs, given both by the non-standardised coefficients (Table 2) and the elasticities (Table 3). Higher suicide rates are jointly determined by:

1 deficiency of coping resources – that is lacking economic activities – ACCOUNT
2 social disruption, distrust and hostility – CRIME
3 heavy binge drinking – ALC

4 hardship of climatic conditions – CLIMATE

5 poor infrastructure for effective business activities in the rural areas – ln(AGR)

6 low manufacturing production, indicating economic depression in industrialised regions with higher 'hidden unemployment' – ln(IND)

7 lower mean private savings per capita indicating financial losses of the population – ln(SAV)

8 higher inflation – ln(CPI)

9 lower proportion of ethnic groups with better patterns of social cohesion/social support assumed – MOSLEM

10 higher numbers of unemployed per one vacancy, indicating lower chances to get employed – UNEMPL.

Table 2 Results from panel data estimation using the GLS random effects model

Variable	*Coefficient*	*z-statistic*	*P*>|*z*|
CRIME	0.004	5.47	0.000
ALC	0.284	18.25	0.000
Ln(SAV)	–1.301	–3.79	0.000
ACCOUNT	–5.024	–3.67	0.000
Ln(IND)	–2.063	–2.57	0.010
Ln(AGR)	2.507	4.55	0.000
Ln(CPI)	0.897	6.05	0.000
CLIMATE	11.948	5.39	0.000
MOSLEM	–0.198	–2.9	0.004
UNEMPL	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

Table 3 Elasticities after panel data estimation using the GLS random effects model

Variable	*Elasticity*	*z-statistic*	*P* > |z|	*Median X**
CRIME	0.160	5.29	0.000	1747
ALC	0.153	15.28	0.000	21.6
ln(SAV)	–0.032	–3.83	0.000	5.35
ACCOUNT	–0.179	–3.69	0.000	1.43
ln(IND)	–0.052	–2.53	0.011	0.73
ln(AGR)	0.063	4.62	0.000	–0.07
ln(CPI)	0.022	6.19	0.000	7.49
CLIMATE	0.132	5.3	0.000	0.44
MOSLEM	–0.010	–2.98	0.003	2
UNEMPL	0.002	2.97	0.003	4.6
y (predict) = 40.1				

*Calculation of elasticity for the variable CLIMATE is based on its mean value.

Deficiency of coping resources turned out to be the strongest predictor of suicide mortality. Suicide rates are higher in the provinces, where the population is missing any opportunities to improve declining living standards via legal and shadow economic activities. This is true for the climatically disadvantaged rural areas and for the economically depressed industrialised regions with high unemployment. These results confirm an association between the behavioural patterns of economic 'passivity' and suicide, which are more common in a poor economic environment.

The factor of insufficient coping is followed by the proxy-variables for social disruption and heavy binge drinking. Climate dummy is the fourth important predictor of suicide mortality. During the period analysed, areas with severe climatic conditions experienced elevated magnitude of transition-related problems – they were disproportionately affected by the hyperinflation. In this study, the impact of climate on mortality has been controlled for the effects of inflation.

Suicide rates were statistically accounted for by the factors related to the core transition-related stressors – for instance, financial losses of the population, inversely measured by inflation-adjusted per capita savings. Inflation itself acts as a significant mortality predictor. This association indicates an independent psychologically distressing role of inflation, since its material effects are taken into account in this model with the variable ln(SAV).

Culture-specific patterns of social cohesion/support demonstrated a protective impact on suicide mortality. We observed an inverse association between suicide death rates 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.

5 Conclusions

The study results support the idea that socioeconomic instability has been detrimental for health of the Russian population. Sustainable development is crucial for the prevention of stress-related mortality. Intrinsically, the obtained results are consistent with research evidence from industrialised countries. Signs of economic instability and recessions have

been found to increase mortality (Brenner, 1973, 1995, 2005), whereas long-term economic growth has been shown to be the central factor in mortality rate decline over the 20th century (Brenner, 2005).

Specifically for suicide mortality, the present study obtained some findings which – to our knowledge – have never been reported before. They concern an essential meaning of economic 'survival strategies' of the population for the prevention of this stress-related cause of death. It was possible to assess both the 'material' and 'psychological' effects of hyperinflation on suicide mortality.

The inferences from the present study are probably applicable beyond the analysed set of Russian regions. They should be valid for other settings which exhibit similar problems in the social and economic spheres.

Key messages:

- Increased suicide mortality can be used as a plausible indicator for lack of sustainability in socioeconomic development.
- Major improvement in suicide mortality must be regarded as one of the important endpoints of sustainable development in countries or regions with elevated suicide death rates.
- Future research should consider the idea that a major source of sustainability in economic development would be that it does not lead to the weakening of cultural and social ties to the extent that suicide rates are elevated over the long term.

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Notes

[1]SDR is the age-standardised death rate calculated using the direct method and standard European population structure.

[2]Aginskii Buryatskii avtonomnyi okrug, Chukotskii avtonomnyi okrug, Evenkiiskii avtonomnyi okrug, Khanty-Mansiiskii avtonomnyi okrug, Komi-Permyatskii avtonomnyi okrug, Koryakskii avtonomnyi okrug, Nenetskii avtonomnyy okrug, Taymyrskii (Dolgano-Nenetskii) avtonomnyi okrug, Ust'-Ordynskii Buryatskii avtonomnyi okrug, Yamalo-Nenetskii avtonomnyi okrug.