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MORTALITY TRENDS AND PATTERNS IN THE CASPIAN REGION OF THE REPUBLIC OF KAZAKHSTAN

Master Thesis

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Mortality Trends and Patterns in the Caspian Region of the Republic of Kazakhstan

Abstract

This work is devoted to the study of mortality trends and patterns in the Caspian Region of the Republic of Kazakhstan. Through the last decade the extraordinary rise in mortality are registered there as well as in the whole Kazakhstan. This region of Kazakhstan also makes possible to identify a large mortality disadvantage for males, especially at working ages. Despite the undergoing decline of mortality along with positive economic development in the region, the intensity of mortality has no perceptible improvement.

Keywords: Kazakhstan, Caspian Region, mortality, life expectancy, causes of death

Тенденции и закономерности смертности в Каспийском регионе Республики Казахстан

Абстракт

Данная работа посвящена изучению тенденций и особенностей смертности в Прикаспийском регионе Республики Казахстан. За последнее десятилетие в целом по республике зарегистрирован высокая смертность. На примере Прикаспийского региона становится возможным показать высокую вероятность летальных исходов для мужчин трудоспособного возраста по всем классам болезней, включая внешние. Кроме того, в данной работе указывается на огромную разницу в тенденциях, несмотря на наметившееся снижение смертности во многих регионах в связи с экономическим развитием, в Прикаспийском регионе демографическая ситуация остается без положительных изменений.

Ключевые слова: Казахстан, Каспийский регион, смертность, продолжительность жизни, причины смерти

I declare that this thesis is my own work under the supervision of RNDr Boris Burcin, PhD. Where other sources of information have been used, they have been acknowledged.

I agree that if any results gained while working on this thesis will be used outside the Charles University in Prague, written permission of the University will be necessary.

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In Prague, ___/___/2009 _____

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Contents

List of abbreviations

AIDS – Acquired immune deficiency syndrome
CEP – Caspian Environmental Programme
CHD – Chronic heart disease
CHF – Congestive heart failure
COPD – Chronic obstructive pulmonary disease
CVD – Cardiovascular diseases
e_0 – Life expectancy at birth
FDI – Foreign Development Investment
tng – tenge
GDP – Gross Domestic Product
HIV – Human immunodeficiency virus
ICD – International Classification of Diseases and Related Health Problems
ICD 9 – Ninth Revision of International Classification of Diseases and Related Health Problems
ICD 10 – Tenth Revision of International Classification of Diseases and Related Health Problems
IHD – Ischemic heart disease
IIMP – International Institute of Modern Policy
RK – Republic of Kazakhstan
LE – Life expectancy
NUTS – Nomenclature of Territorial Units for Statistics
SDR – Standardized death rates
UNDP – United Nations Development Programme
UNEP – United Nations Environmental Programme
WHO – World Health Organization
ha – hectare
na – not applicable
et al. – and others
ibid. – in the same place

List of tables

List of figures

Chapter 1

Introduction

1.1 Objective of the study

In the past, the notion of security was primarily conceived in terms of neutralizing military threats to the territorial integrity and political independence of a state. However, in recent decades, it has been considerably broadened through incorporation of nonconventional threats and factors promoting tension and conflicts. And the main for the country and government become the questions concerning the internal state of its territories, such as socio-economic development and demographic patterns of the population.

Studies on regional morbidity and mortality have been conducted for several of the Kazakhstan's regions, also a few for some districts of the Caspian region. Notably after the foundation of sovereign Kazakhstan in 1991, differences among the Eastern Kazakhstan were compared to the Northern Kazakhstan, because of their economical significance and environmental condition.

Within Kazakhstan there is not only a mortality gradient between the North and South, but also between the East and West. Mortality in the Caspian region is in the highest level among the districts in the Western part of Kazakhstan. The Caspian region of Kazakhstan unites two oblasts: Atyrau and Mangystau with the territory nearly 435 thou. km^2. The center of Atyrau oblast is located in Atyrau, and Mangystau – Aktau city. These oblasts have a distinct specialization in an extractive industry. The main sector of regional industrial system is oil and gas production. There are many companies and industrial enterprises, including foreign. Along with deterioration of environment, not only low life expectancy, but also other demographic factors show unfavorable trends, so that for example out of state infant mortality and instant increase in morbidity of population are resulting in accelerated population decline.

Analysis of mortality in the Caspian region is of specific scientific interest. First of all, since 1991 West Kazakhstan has undergone an enormous socio–economic transition highly connected with oil and gas development in the region and has also experienced an important change in

mortality. In general, the mortality gap between the Caspian region and the rest of the country has diminished. Second, it is worth examining why the Caspian region is on the lower end of the range among all Kazakhstan areas. Surprisingly little research has been devoted to this topic. This study aims to fill this gap. In this context, mortality and corresponding life expectancy are often referred to as a measure of public health. Inequality in mortality is a common phenomenon. There are various determinants of this inequality, including factors such as age and sex as well as regional, behavioral and socio–economic factors.

This study will consider variation of mortality differentials within the Caspian region and their determinants. This thesis aims to analyze all–cause mortality patterns in the region and their cause–of–death components.

1.2 Hypotheses

The main aim of the study is to give the overall picture of the mortality trends and basic patterns related to the mortality in the Caspian region. This research would be elaborated further in the context of the independent research based on the present speculations and expectations. The common history of the Caspian region as the socio–economic unit within Kazakhstan is very young and very interesting. This work urges to scrutinize not the consequences of the processes in their development, but pay an attention to their causes. That is why there are some important research questions that examined in the frame of the work.

First of all, what are the main indicators that could be significant for the goal of revealing the patterns inherent to the given region?

Secondly, if they are so different from the trends of the whole Kazakhstan or they are the part of the overall trends followed?

Though, a general overview on the mortality situation of the region is aimed at the following hypotheses will give a guideline through the study. They refer to several levels: to the standing of the Caspian region within the Kazakhstan context and to the cause of death specific mortality pattern.

Hypotheses with regard to the general mortality level:

1. Mortality in the Caspian region will decrease and approach the Kazakhstan's average level.

Several factors, such as the development of the health care system, socio–economic development and even migration, are involved. Improvements in the health care system will strengthen the mortality decline. A general improvement of the socio–economic conditions will also contribute to a mortality decline in the region. On the other hand it is known, that the Caspian region lags behind the Kazakhstan's average, which might defer the improvement. The Caspian region always have experienced high rate of morbidity among the population. In this case assuming also a healthy migrant effect, this will have a negative impact on the mortality improvement.

Hypotheses with regard to cause–specific mortality:

2. Convergence of the Caspian region to the Kazakhstan's average in avoidable mortality.

The improvement of health care situation after 2000 should result in a substantial decrease of the avoidable mortality. If medical equipment is standards to date, so that mortality differentials must be traced back to other factors.

3. Excess mortality from neoplasms in the Caspian region.

Given the specific industrial and environmental circumstances in the Caspian region – oil and gas deposits with neighboring to deserts and the Aral Sea – this will result in excess mortality of the region compared to the Kazakhstan's average.

4. Excess of mortality in external and alcohol–related causes of death in the Caspian region.

External mortality will be higher in Caspian region due to dominance of rural districts because of high likelihood of traumatism during working time and low level of safety on manufactures. Unemployment and lack of societal offers evokes drinking and thus increase of the alcohol–related mortality. Psychosocial stress caused by transit to modern state of economy and changes in socio–cultural context is continued, but it is very likely that suicide mortality will not rise very substantially, as mortality due to transport accidents.

Hypotheses with regard to socioeconomic situation of the Caspian region:

5. Supremacy of fewer urban districts aggravates and hence increases inequality.

Socio–economic situation will be improving in urban areas and undergo a relative worsening in rural areas. These results in an urban–rural mortality divide and an inequality increase with respect to mortality.

6. Excess mortality, especially in rural districts.

7. The improvement of socio-economic situation and diminishing of women's ignorance of primary medical hygienic rules in rural districts, increase of their awareness of their health and health of their children would led to the substantial decrease of maternal and perinatal mortality. In this case, the number of physicians is a measure of the health care provision.

1.3 Theoretical framework of the study

The huge territory of Kazakhstan and a variety of living conditions in his areas do inevitable appreciable distinctions in mortality of the population in different regions. In neighboring Russia, for a long time noted pattern of spatial variability of mortality was found in its increase in a direction from the southwest to the northeast ("so-called, northeastern gradient"). The majority of territories with rather high mortality are located on the north of the European part of Russia, in Middle and Northern Ural Chain, in Siberia and in the Far East. Territories with rather low mortality are in the North Caucasus, in the Volga region and Central Chernozem region. The most densely populated areas located in the Central part of Russia have basically average level of mortality. The Northeastern gradient of mortality mostly in detail has been described and studied only in 1970 when Russia experienced a slow growth of mortality and a decrease in life expectancy.

Regional distinctions in mortality level basically have been caused by mortality at the same age (from 20 till 65 years) and from the same reasons (diseases of circulatory system and accidents) which brought the basic contribution to the general decrease of life expectancy among all age groups within the country. Influence on mortality in frames of regions with respect to infant mortality and mortality in older ages as from other causes was rather limited.

In the middle of 1990s Shkolnikov has conducted the research aimed to reveal the patterns of the northeastern gradient theory of mortality in modern Russia. And he has come to the following. As a whole, the regional differentiation of life expectancy in 1990 does not submit to any general pattern as accurately as in 1970. Mainly, it is due to mosaicism of all processes that highly connected with the specifics of each particular region (Shkolnikov, 1997).

Mortality levels and trends provide important information on the many serious diseases and injuries that affect people. Information on death and its causes cannot provide a complete picture of people's health, but it can contribute much to that picture and help to assess the nature and extent of progress. Studies of the trends in mortality and related statistics can help to explain how the health status of the population is changing and assist in evaluating the health system.

For example, life expectancy is a much-used universal indicator of a country's health, and mortality data are needed to calculate it. More specifically, a clear increase in the death rate of a disease will be an early indication of a problem, whereas a fall in a rate may help confirm that measures to curb a known problem are working. In addition, it has been shown that some groups in the population have markedly higher death rates from some causes of death, or overall, and this can guide planning as well as providing information about equity in a society and its health system.

In this case the theory of epidemiological transition at first time developed by Omran and then extended by other authors (Olshansky, 1986) is very helpful. The theory was born as a reaction on recognized limitations of the population theory and the need of approaches to population dynamics. The theory focuses on the complex change in patterns of health and disease and their demographic, economic and sociological determinants and consequences. Omran recognised that the changing pattern in mortality in the developed world, as indicated by the demographic transition, is defined by four successive phases (Omran, 1971). For example, the second stage, characterized by the spread of infectious and parasitic diseases, such as tuberculosis and diarrhoeal diseases were rapidly replaced by more sanitary living conditions, improved medical technology and better lifestyles (Olshansky, 1986). Nevertheless, such diseases remained the leading causes of death, although non-infectious diseases did become more significant (Spijker, 1971). The third phase of the epidemiological transition is known as the "age of degenerative and manmade diseases". This stage is distinct from the earlier period because chronic conditions such as cancer and ischemic heart disease (IHD) gradually replaced communicable diseases as the leading causes of mortality. Mortality profiles in the developed world changed as large improvements were made in childhood survival rates that contributed largely to the advances made in life expectancy at birth. The level of mortality became low and stable, and the average life expectancy exceeded 70 years. It

is during this stage that fertility becomes the crucial factor in population growth. During the second half of the century, improved survival rates at older ages also took place, resulting in a further increase in life expectancy. This occurred at a time when countries modernized and social, economic and health conditions improved (ibid., p 23).

Theoretical frameworks, which could explain mortality differences between regions usually, incorporate among others the following factors (Bobak et al., 1996):

a) Medical care: based on differences in access and quality of medical care;

b) Environmental pollution: causes certain diseases in definite areas;

c) Socio-economic situation: education enforces healthy behavior, wealth gives higher quality of life, and economic affluence permits its implementation;

d) Lifestyle and diet: smoking, being overweight, physical inactivity and an unhealthy diet are risk factors for many chronic diseases;

f) Psychosocial stress: may cause excess mortality.

Others, mainly Russian scientists, composed these factors into 4 main groups (this classification is also approved by the WHO):

a) environmental condition with influence share on human health – about 20 %;

b) heredity (good or bad inheritance) – about 20 %;

c) lifestyle – about 50 %;

d) medicine and medical care – about 10 %

In this context Alekseyev (1991) thought that lifestyle was responsible for 50-52 % of human health, heredity took about 18-25 %, environmental conditions – 10-20 %, medical care – 10-15 %. By Lissicyn (2002), factors of bad or good inheritance made up 20 %, ecological – 25 %, social – 25 %, psychological – 25 %, related to medicine – 10 %, and cultural – 5 %.

Hudoley and Mizgirev (1996) claim that in the closest 30-40 years keeping the recent trends of industrial development human health would depend on the quality of natural environment on 50-70 %. In the same time Savvateyeva (1998) thought that 25-50 % of all diseases could refer to ecological factors.

In the case of lifestyle and its influence on human health are very interesting the works of Sobotik and Richtarrikova, where the visual evidence of interaction between level of education and socio-economic position are demonstrated. University graduates experienced better health conditions than people with only basic education and having higher mortality (Richtarikova, 2004).

These factors are widely used to explain regional differences in general (Dinkel, 2001). Usually, in mortality analyses, small-area variation is mostly explained by socioeconomic differentials. Environmental pollution and supply of health care are factors of little importance. Individual behavior, biological and genetic dispositions are the linkage between the mentioned factors (Howe, 1986).

Given the strong need of regional analysis for planning, many problems are nevertheless faced in applied regional mortality analysis. Buckley points at the strong need for standardization and enumerates sex, age, and also structure of marital status, nationality and profession (Buckley,

1998). Furthermore, small numbers may lead to statistical insignificance. The impact of migrants cannot be traced back easily, and thus healthy migrant effects are probable. When regarding cause of death statistics and coding practices differ, the result will be biased. As regional analyses are applied to administrative areas for practical reasons, these areas do not necessarily reflect the intended purpose. This problem of administrative units can be reduced by studying patterns of nearby regions (Rosen et al., 1985).

Chapter 2

Literature Review

2.1 Socio-economic situation of the Caspian region and Kazakhstan

The geographical focus of this work used to be a classical hinterland. For a long period in history the area was even called "Transcaspia", in other words the land behind the Caspian Sea. Also from the perspective of the now independent former Soviet Republics Kazakhstan and Turkmenistan the strip of land bordering the Caspian Sea is a distant province remote from the capitals.

But things are changing. The geopolitical centre of gravity has shifted east and with the rapid development of China's economy, another pole has emerged, rendering the terms "Trans", "hinter" or "behind" invalid for this region. And with the rapid developments linked to oil and gas exploration in Kazakhstan and Turkmenistan, the sleepy regions along the coast are waking up. Aktau, for instance, has become a boomtown by international standards (Smailov, 2002).

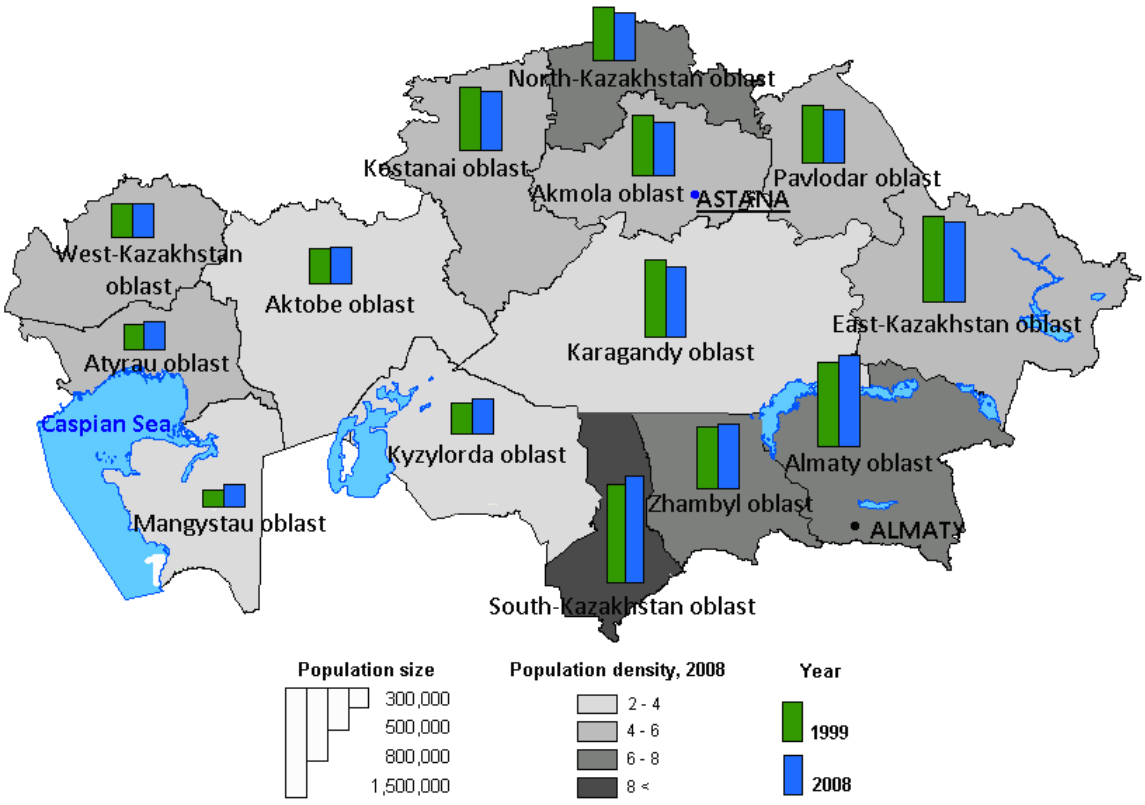
Kazakhstan's regions of Atyrau to the northeast and Mangystau to the east of the Caspian sea make up 10 % of the country's territory and about 5 % of its population. With 2–4 inhabitants per sq km, population density is low (see Figure 1). However in the past 30 years the region's population has increased by about 35 %. The Caspian capitals of Aktau and Atyrau accommodate nearly half the total population in each region. Kazakhs constitute the ethnic majority (80–90 %) in both cases. Russians, Tatars and other nationalities, including foreign laborers and labor migrants, make up the rest (Agency on Statistics of the Republic of Kazakhstan, 2008).

The break–up of the Soviet Union introduced four new actors to the region: Azerbaijan, the Russian Federation, Kazakhstan and Turkmenistan. With Iran they all now border on the Caspian Sea. The legal status of borders on the Caspian Sea and its shelf resources have been under negotiation ever since, accompanied by a build–up in military forces in the region.

In the days of the USSR the Caspian region underwent considerable social and economic change. Compulsory free, universal education and the provision of universal health care were among the Soviet Union's major social achievements. But the development of large–scale

agriculture and the meat industry was accompanied by a radical change in the traditional way of life of the nomadic population of Kazakhstan, pushed into adopting a sedentary life style.

Figure 1 – Population size in the Caspian Region and Kazakhstan in 1999 and 2008 and population density (persons per km²) of Kazakhstan in 2008



Source: Own calculations based on data of the Agency on Statistics of RK, 2008

In the Soviet Union's centrally planned economy, Kazakhstan developed its mining and processing industry. Oil production expanded although most of its output went to the military–industrial complex, well established in the Kazakh SSR, with the nuclear test sites at Semipalatinsk and Kapustin Yar, and the Baikonur space centre (Akiner, 2004).

In Kazakhstan, as in most oil exporting countries, oil is produced in only a few regions of the country: five out of fourteen oblasts, with 21 oil–producing districts out of a total of 158 districts (not including cities). The Atyrau and Mangystau regions play an important role in the country's economy: in 2006–2007 two–thirds of Kazakhstan's crude oil and a third of natural gas were produced in the Caspian region. Their combined output accounted for 16.5 % of Kazakhstan's Gross Domestic Product (GDP) (Agency on statistics of the Republic of Kazakhstan, 2006). Industry, mainly the oil and gas sector, contributes 70–90 % of GDP followed by transport and services.

Uranium production is another feature of the eastern Caspian region. At its peak in the 1980s Kazakhstan was producing more than one–third of Soviet uranium at more than 30 mining sites. The discovery of vast uranium deposits in the deserts of Western Kazakhstan led to the establishment and rapid development of uranium extraction and processing around Aktau 54, with large open–cast mining pits, a processing plant, the Koshkar–Ata tailing site, and the MAEK nuclear power plant. At present more than half of all the radioactive waste in Kazakhstan has accumulated around Aktau, Mangystau region.

The Soviet nuclear industry also flourished in the region until the early 1990s, for example at the formerly "secret" town of Aktau where it created a large uranium–tailing dump and onshore nuclear station. Major military sites in Kazakhstan included the nuclear and weapon test sites of Azgir, Kapustin Yar, Taysogan, Ashuluk and Say–Utes, as well as the uranium–mining industry.

Since independence, the coastal regions of Kazakhstan have enjoyed a boom in the energy sector with massive investment in local industry and infrastructure. The investments have mainly been made by major Western energy firms, which expanded their presence in the region in the early 1990s.

Between 1993 and 1999 Kazakhstan attracted US$9.29 billion in Foreign Direct Investment (FDI), about 53 % of which went to the oil and gas industry (Brill Olcott, 2002).

FDI has continued to increase from US$1.8 billion in 1999 to US$4 billion in 2004. An estimated 80 to 90% of total FDI goes to the oil and natural gas sector. Because of the booming oil and gas sector, GDP in Mangystau and Atyrau regions has increased since 1991 respectively by a factor of two and four (Agency of the Republic of Kazakhstan on statistics, Ministry of Natural Resources and Environment Protection of the Republic of Kazakhstan 2001).

The industrial sector employs 25–30 % of the economically active population in each oblast. But alongside the booming energy sector, the share of agriculture in GDP in Atyrau and Mangystau regions has steadily dropped.

It is reported that a significant reduction in agricultural output, coupled with a threefold fall in farm–gate prices, led to a fivefold drop in agricultural added value. This cut living standards and increased poverty in rural areas (Chulanova, 2007). Fifteen years ago the agricultural sector of the Atyrau province contributed 22 % of GDP whereas it now accounts for less than 3 %. Cereal cultivation decreased tenfold and cattle and meat production dropped substantially, though in 2000–2007 the trend was once more upward. In Mangystau province, where the role of agriculture was much less important than in Atyrau, the contribution of the agricultural sector to GDP – essentially cattle breeding – dropped from 4 % to less than 1 %.

Over the same period fishery output from the Caspian Sea and the Volga–Ural deltas decreased by a factor of two to three. Fish catches in Atyrau fell from more than 20000 tones in the early 1990s to 15000 tones in the 2000s. In Mangystau catches plummeted from 9000 tones to 500 tones (Agency of the Republic of Kazakhstan on statistics, 2007).

Sturgeon catches dropped dramatically, by a factor of more than 20, despite increasing efforts to farm the fish. Illegal poaching of sturgeon and black caviar, the cash commodities for many rural

coastal communities, has aggravated the productivity losses of the Caspian's biological resources (Akhmetov, 2006). The world food crisis may amplify the potentially fragile situation in the eastern Caspian region with declining agricultural and fish production or may be also an opportunity for reversing the local trends.

The Gini Coefficient is an indicator measuring inequalities in income distribution. For Atyrau and Mangystau in 2002 it showed values 0.43 and 0.36 respectively, compared to Kazakhstan's average 0.33 (Pomfret, 2006; World Bank, 2004).

Although in 2006–2007 inequality and poverty levels decreased all over Kazakhstan compared with 2001–2002, they nevertheless remained high in Atyrau and Mangystau despite these regions' high levels of per capita GDP. Between 2001 and 2006 the percentage of the population living below the subsistence minimum in Mangystau fell from 60 % to 26 % and in Atyrau from 56 % to 24 % (Agency of the Republic of Kazakhstan on statistics, 2007).

Despite the importance of oil production in Mangystau, almost 40 % of its total population is poor, which is higher than a poverty headcount in Kazakhstan's Zhambyl region, which has the lowest regional product per capita (Pomfret, 2006). At the same time, in Mangystau in 2003, three out of five people were poor in rural areas, compared with only one in five in urban areas (Chulanova, 2007). The differences in income distribution between urban and rural areas have significantly increased since independence although the underprivileged can obtain some social assistance and partly compensate the differences in revenues.

A recent survey of the coastal regions of Kazakhstan showed that the rural population's main problems were unemployment and low salaries, lack of entertainment and more generally opportunities for children and young people, and environmental impacting on the quality of life in these regions. The sharp decline in the importance of agriculture and fishing, which face a gloomy future, are key factors underpinning the deterioration of the economic situation in rural areas (UNDP, 2007).

Overall in the Caspian Sea regions of Kazakhstan tap water is available to approximately 70–75 % of the population (living mostly in the towns of Atyrau, Aktau and Jana Uzen) (NESSD, 2006; Mangystau province programme "Drinking water 2003–2010"). Again the main differences in access are observed between urban and rural areas. In both Caspian regions domestic use of freshwater (for drinking and household services) amounts to 15 million cubic meters a year. In rural areas – such as Beiney, Mangystau, Tupkaragan, Karakiyan districts – water use is lower than 50 liters a day per person, which is below basic health and sanitation requirements.

The Kazakh government, which considers the supply and quality of water a high priority, has developed the "Drinking Water Programme 2003–10" which covers both eastern Caspian regions. The programme has been allocated substantial financial resources, with a national budget exceeding 100 billion tng. Thanks to implementation of this programme the share of the population with access to tap water increased by roughly 3–7 % by 2006. Furthermore water filters and modern desalination facilities are being installed to improve drinking water quality.

Some environmental experts suggest that damage caused by oil pollution could – in the long term – exceed short–term profits generated by oil development (Nogaev, 2007; Diarov, 2007).

Experts point out that once the region's energy resources are exhausted, it will have to cope with the results of several decades of oil and gas extraction (polluted environment, depleted biodiversity, etc.) without the financial resources to remedy the damage wrought by industry. Long–term damage and impacts could consequently far exceed current short–term benefits.

Lack of research makes it difficult to establish clear links between these sources of pollution and health problems. Nevertheless, the deterioration in public health, and particularly the increased incidence of respiratory diseases and cancer can be partly attributed to the impacts of air pollution. In 2005 there were three times more respiratory diseases among teenagers in Atyrau province than in 2001. Health authorities also reported a threefold increase in neuropathy problems (Granovsky 2003; Akhmetov 2006).

Furthermore, with the decline of fishing and agriculture, employment opportunities are becomingly increasingly scarce in the construction industry and sectors other than energy. Such a situation further increases the differences in living conditions between urban centers and rural areas, where making a living is increasingly difficult.

The Caspian Sea region also strikes a balance between the economic gains from rapid development of energy resources, and the risk of over–exploitation and environmental degradation, particularly in shore and sea zones. Depletion of vital ecosystem products would impact negatively on human development. Urban areas must deal with very fast growth and increasing dependency on the energy sector to fund such development. At the same time rural areas are facing deepening poverty and a deteriorating environment. These changes undermine the region's resilience and heighten its vulnerability to powerful social tensions.

2.2 Analytical overview of mortality in Kazakhstan

According to the statistical reports the proportion of infectious and oncologic illnesses in the Republic Kazakhstan does not decrease. The main reason of such situation is laid not only in a deterioration of the general ecological conditions of residing of the population, but also in factors of social character. Mortality data for each oblast (region) are available by age group and gender through the period from independence. Although Kazakhstan is roughly 45% rural, here is a restriction of urban mortality because substantial underreporting of rural deaths is likely (Anderson and Silver, 1997).

Today, still high is a maternity and child mortality. According to the official reports, the infant mortality is amongst the highest in South-Kazakhstan (24.8), East-Kazakhstan(23.3), Atyrau area (21.9), and in cities of Almaty (21.8) and Aktobe (21.7). It is one of the consequences of the political and economic turmoil of the 1990s in Kazakhstan. According to the World Bank, following a decline in infant mortality rates from 50 per 1000 live births in 1980 to 42 per 1000 live births in 1990, infant mortality rates then rose to 56 per 1000 live births in 1995 and to 81 per 1000 live births in 2001. In general, infant mortality rates throughout the Central Asian countries, including Kazakhstan, have risen from Soviet–era levels, while rates in other formerly Soviet Union

countries, including Russia, have fallen (Falkingham J. et al, 1997). In Kazakhstan, infant mortality levels, both pre– and post–independence, have been relatively high, with Central Asia generally featuring the highest infant mortality rates during the Soviet–era period (worldbank.org, 2001). Furthermore, while the formerly Soviet Union nations in Eastern Europe and the Caucasus have improved their infant mortality statistics and the other Central Asian nations have kept levels of infant mortality roughly the same, Kazakhstan's infant mortality rates have increased rapidly (Jones E. and Grupp F. W., 1983). This is especially important in the case of perinatal mortality, as Becker et al. (1998) document for neighboring Kyrgyzstan and as Buckley (1998) discusses in the Central Asian context, thereby making life expectancy at birth estimates highly inaccurate.

Maternal mortality is very high in Mangystau (115.1), Atyrau (99.0), Kyzylorda (60.1), the South-Kazakhstan (55.6), Pavlodar regions (53.2) and in Astana city (48.2). For the West-Kazakhstan oblast this indicator in comparison with previous years has significantly increased (IIMP, 2008).

Table 1 – Basic indicators of maternal and infant mortality in Kazakhstan, 2007 and 2008

	Child mortality per 1 000 livebirths		**Maternal mortality per 100 000 livebirths**	
	2007	**2008**	**2007**	**2008**
Republic of Kazakhstan	**14.7**	**20.9**	**50.3**	**33.7**
Akmola oblast	11.7	20.2	35.5	16.7
Aktobe oblast	12.9	21.7	27.4	25.3
Almaty oblast	10.1	15.2	31.2	32.6
Atyrau oblast	14.2	21.9	99	15.6
East-Kazakhstan oblast	16.0	23.3	55.6	16.6
Zhambyl oblast	16.5	21.1	40.6	30.4
West-Kazakstan oblast	14.9	18.0	21.0	93.9
Karagandy oblast	10.6	17.4	55.3	17.9
Kzylorda oblast	19.7	20.4	60.1	68.2
Kostanay oblast	14.3	17.3	33.7	15.8
Mangystau oblast	19.6	20.6	115.1	82.3
Pavlodar oblast	10.6	20.8	53.2	15.0
North-Kazakhstan oblast	13.0	19.8	73.8	46.6
South-Kazakhstan oblast	17.2	24.8	55.6	34.4
Astana city	12.5	14.7	48.2	71.0
Almaty city	13.8	21.8	32.3	11.4

Source: Data of the IIMP, 2008

These extremely high indicators partly depend on the adoption of initial rules proposed by the WHO concerning the weight of newborns. Today, in Kazakhstan, as in the other countries throughout the world newborn with weight of 500 grams accepted as a live birth. Operative data on deaths of children below 5 years, taking into account a small weight of body for the period from 2007 to 2008 shows an overall increase of this indicator on 47,6 %, especially for

South-Kazakhstan oblast, Almaty oblast, the East-Kazakhstan oblast, Zhambyl, Karaganda, Atyrau, Pavlodar regions and Almaty city.

The analysis of morbidity of the population by infectious (including tuberculosis) and oncologic illnesses shows increase in the number of people that for the first time registered with such diagnosis. In 2007, 179 persons (per 100 000 people) were registered by malignant neoplasms and 1 391 persons with tuberculosis. Morbidity from tuberculosis is very high in Kyzylorda, Atyrau, Mangystau, North-Kazakhstan and Aktobe regions.

Diseases with malignant neoplasms are dominated in East–Kazakhstan, Akmola, Pavlodar, Kostanay, North-Kazakhstan oblasts, and in cities of Almaty and Astana.

According to the publication of the Institute of oncology and radiology of the Ministry on Health of RK, there are 18 medical institutions provided services of oncologic care from which 14 regional, 2 municipal (in Astana and Almaty cities), 2 national – in Almaty oblast and Semipalatinsk, the 19th is the named Institute of oncology and radiology (Ministry of Health, 2009).

Among problems and the reasons of high mortality of the Kazakhstan population early diagnostics and treatment of socially–significant diseases has important value. The decrease of indicators in maternal and infant mortality depends on the question of at what stage of diagnostics it is possible to trace causes of illness and to take preventive measures. Meanwhile Ministry on Health registers the fact of high mortality among the population, inadequate use of the expensive equipment on diagnostics and treatment, and the main thing is absence of qualified medical personnel. For example, at regular meeting in Aktau city, the Minister of Health care of RK has noted the unfavorable fact of growth of socially–significant diseases in spite of the fact that with a view of rendering of qualitative medical services to the regional population the spadework on building of the large medical institutions, such, as a regional oncologic clinic on 100 beds, the regional blood centre, the regional centre for the protection of motherhood and children in Aktau city, the central hospital in Shetpe settlement, the central district clinic in Kuryk settlement. Despite annual increase of financing in public health services, the region is unstable in the sense of morbidity and mortality among population from tuberculosis, as well as of maternal and infant mortality. Spent at the expense of means of the republican budget prophylactic inspections of women and children do not give the expected effect. Only 30 % of women of fertile ages have passed physical examination in order to reveal cancer on the earliest stages and it is the lowest indicator in the country. Because of that is the certain growth of oncologic diseases in the region. 60 % of attendances to the appropriate medical centers concerning this disease are the advanced (neglected) cases. In 2008, 47 cases of malignant neoplasms on last stages were registered. These patients practically require not treatment, but social care. This year 24 oncologic cases at late stages are revealed. Unfortunately, the region has only 2 mammographic machines. And coverage of women below 35 years old by prophylactic inspections of this profile makes only 3.5 % (Ministry of Health, 2009).

Unsatisfactory also is prophylactic inspections among children, this procedure pass only 70 % of children. Thus comes to light only 26 % of the whole diseases. The number of treated positively

children are only 40 % in comparison with the national – 58 %. The main reason of such situation is seeing in absence of succession of work between physicians and narrow specialists and also in the insufficient efforts on improvement of medical care quality.

The same situation is observed on the eastern part of the republic. So, during 9 months of 2008 the Eastern–Kazakhstan oblast has taken the first place among regions by oncologic diseases. Physicians blame the industrial enterprises and nuclear test polygons as the main causes of death and morbidity in the region. Almost 900 oncologic patients were registered from only the beginning of year. And it is only the official data. Semey city is one of the leaders in Kazakhstan by death occurred from cancer. Here the disease indicator in one and a half time exceeds average on the country (Tatibekov, 2008).

Experts ascertain that preventive maintenance, diagnostics and treatment of cancer in Kazakhstan does not correspond to the world standards. Adequate provision of the population by beds in oncologic clinics is only 73 % from the specifications given by the Ministry of Health. Unfortunately, diagnostic equipment and medical resources remains at the level of 1970 years of the past century. As the chairman of Social Council Aytkul Samakova marks, the basic question is an inaccessibility of modern diagnostics and weak provision of technical equipment in oncologic institutions. Not evenly because of simple breakage of equipment patients some years cannot receive treatment, including children. In that case, it is necessary, primarily, for the Ministry on Health to order rules concerning diagnostic equipment, modern techniques for treatment and medicines, to create the republican centers on radiological diagnostics, to make the decision on staffing of oncologic and oncohematologic services. It is necessary to improve the standards of legal base in interests of rendering oncologic and oncohematologic help in the country (IIMP, 2008).

Physicians during the regular discussions on the distribution of infectious diseases, first of all, tuberculosis pay attention to insufficient conditions in hospitals: congested people in a ward, non–observance of principles of cycles during treatment, absence of the appropriate ventilation system and a thermal mode, an insufficient and poor diet of patients, non–observance of a. One of the ways of decreasing the morbidity is the early revealing of diseases allowing in short–time period to isolate the patient, begin treatment and as consequences, to prevent infection spread. The X–ray diagnostics of the population in this case does not lose the urgency and even today has no alternative. For example, in Akmola region more than 1.5 thousand people fall ill with tuberculosis annually. This number is including children and teenagers who take hospitalization in tubercular clinics at the intensive phase of disease, then continuation of treatment on the second phase is required the treatment in sanatoria. However, the situation which has developed now does not allow spending a complete course at all stages of treatment that frequently leads to the fatal repetition of the disease. So, there is an acute necessity of building of sanatorium for children and teenagers on 250 places and sanatorium for adults on 150 places, a boarding school of sanatorium type in the regional centre for isolation and improvement of health among the contacted people, most of all the members of the family. Also, there is a need in staffing of tubercular clinics among them 89 % in

municipal clinics, including 66 % of the regional clinics. It is significant, that 20 % from it is working pensioners (www.mz.gov.kz).

On the regional level the republic has the same problems. So, there is a problem of hospitalization of patients with an active form of tuberculosis in Kokshetau city. Only for the period from the September, 4 till September, 18th 2008 there was registered 14 newly revealed patients and only three of them were hospitalized. It is common that the principles of distribution of patients on types are not observed, there are some cases when patients with chronic and medicine–ignored forms of the disease were placed with the newly revealed patients.

In four areas of the Southern Kazakhstan people sick by tuberculosis are compelled to be treated in extreme conditions. Rural hospitals collapse, and in order to have roentgen diagnostics people should go in oblast and regional centers for many kilometers.

The main trouble of physicians is absence of the special medical equipment. For example, in a tubercular clinic of Arys (town on the west of the oblast) there is no machine for roentgen diagnostics of lungs. In order to have roentgen diagnostics people should go directly to the central regional hospital, the available equipment is obsolete or even has failed. Similar situation occurs in tubercular clinics in Turkestan, Otyrar and Sairam regions. While expensive buildings stand idle without the equipment, patients with the open form of tuberculosis are compelled to reach districts by their own (www.mz.gov.kz).

The problem of interrelation between environment and human health in the Republic Kazakhstan gets more and more acute character from year to year. Pollution of the environment and its influence on human health has a strong tie which is traced on the basis of data on level of morbidity, emissions of polluting substances in atmosphere from stationary sources, dumping of the polluted sewage in reservoirs, toxic waste, availability of potable water and quality of water, etc. According to the results of monitoring in the cities of the country included in a survey, elaborated by the Ministry of Environment and Protection, environmental pollution level is still exceed sanitary and hygienic norms. In 2007, the greatest level of air pollution was observed in cities of Almaty (12.6 mkg^3/km), Shymkent (11.2 mkg^3/km), Aktobe (9.5 mkg^3/km), Ust–Kamenogorsk (7.2 mkg^3/km), Temirtau (8.6 mkg^3/km), Ridder (9.0 mkg^3/km). High air pollution in Ust–Kamenogorsk, Shymkent, Aktobe, Ridder, and Temirtau was formed owing to influence of emissions of the enterprises of color and ferrous metallurgy, in Almaty city at the expense of adverse for dispersion of impurity of environmental conditions. The worst quality of potable water is in Akmola, Kyzylorda and the Southern Kazakhstan regions. In Kyzylorda region the indicator of discrepancy of tests on tap water on sanitary–chemical indicators makes 5.1 %, on microbiological indicators of 5.3 %, on the decentralized sources accordingly 23.4 and 6.5 % correspondingly (CEP, 2006).

Level of morbidity in Kyzylorda region also remains high; especially because of high level of morbidity with active form of tuberculosis (16.7 per 100 000 people) the area is in the leading position even among such ecologically unsuccessful regions, as the Eastern and Western Kazakhstan.

In the Northern Kazakhstan the growth of morbidity by tuberculosis among children on 5.8 % is marked (from 17.1 per 100 000 people in 2008 to 18.1 per 100 000 people in 2008). According to the head of the medical department Kairgeldy Isineyev, mortality from tuberculosis remains as one of the highest in republic. For the first half of the year mortality level from tuberculosis has made 12.8 per 100 000 people (a national indicator – 9.1).

The high number of such mortality is laid in insufficient staffing of hospitals by narrow specialists. For example, in Akmola region the staffing of tubercular clinics about 89 %, including 66 % of regional clinics, from which 20 % are working pensioners. The clinics in Egindykol and Enbekshilder districts, the Shchuchinsky tubercular clinic are not completed by medical personnel. Attraction of young specialists in this field of medicine is one of the major problems faced the government and local authorities.

Taking into account that the considerable part of patients with tuberculosis is the people from marginalized layer of the population, it is necessary to provide material aid for a full diet at the phases of treatment, additional financing of their attendance of the tubercular clinics. It is significant that the size of the social aid to such persons from the municipal and local authorities grow from 532.5 thousand tng to 4.6 million tng (current rate $1=150 tng). However, as a whole this help is insufficient.

The most part of the problems set forth above in struggle against the diseases such as tuberculosis demands considerable financial funds. However, some question can be solved by carrying out of a complex of actions as 100 % population inspection by X–ray diagnostics method, hospitalization in time and qualitative and compulsory treatment.

2.3 Regional variation

Regional mortality variations are observed throughout the whole world. Generally, the smaller an area is, the greater the differentials (Buckley, 1998).

Several studies on regional mortality in Kazakhstan have been conducted over the last few decades, with emphasis on both the interregional differential as well as the intraregional differentials. For a comprehensive overview who published studies on regional mortality in Kazakhstan with a focus on various regions (Becker, 2005).

Few analyses of mortality are dedicated to the state of the Caspian region. There were found some districts of the Caspian region to have the highest mortality sites within West Kazakhstan and therefore also within Kazakhstan. The districts concerned are situated in the East and in the middle of the Caspian region. Urban areas exhibit a clear mortality advantage compared to rural areas (Granovsky, 2004). To get an impression of the work, which is closely related to the topic of the present study, the three most important studies on mortality in regional level are highlighted.

Dinkel (2001) did one of the studies that explicitly analyzed mortality patterns (besides fertility) in Germany for the time before and after Unification. His key point was the excess mortality in the East Germany at young adult ages for both sexes. In middle–aged men, he also found that mortality

rates were by far higher than the GDR and German averages. This trend existed even before Unification. He explained the higher mortality in young adult ages with a higher traffic accident fatality rate (Dinkel, 2001).

A small–area analysis on regional differentials across the districts of the Caspian region conducted by the Ministry on Health of the RK focuses on methodological aspects of small–area mortality analyses. They identify significant differences in life expectancy levels across the districts of the Caspian region. People in urban districts feature higher life expectancy than people in rural districts, and this fact is even more pronounced in men than in women (Becker, 2005). Another study conducted by the Ministry of Environmental Protection of the RK in the Caspian region also came to this result, but further analyzed the impact of certain causes of death. This study covered the years of 2003–2004, thus the transition time is not included. Attention is drawn to accident mortality and mortality of the digestive organs. These causes are specified to explain the life expectancy decrease from 2003 (www.atyrau.kz, 2006). Statistical reports on population movements from the Agency on Statistics are not rather descriptive.

With regard to global mortality differentials, Great Britain was often the subject of these analyses. The UK for example exhibits a strong north to south decline in mortality. Mortality is, generally lower in Southern parts with an especially bad situation in the South of Scotland and the Lancashire area (Howe, 1986). A cross–national study on the mortality of Belgium, The Netherlands and the German federal states during the 1980s, was executed by van der Veen (1994). The regional pattern showed a privileged position of the Dutch provinces, followed by the Northern Belgium regions.

Causes of death are widely used to identify regional differences on the basis of the specific etiology of a disease. For example respiratory diseases are allowed for environmental pollution. If there is no significant contribution of certain diseases to life expectancy, this can have two reasons. A disease either has major regional differences, but only a minor number of deaths. Alternatively, there are insignificant differences in regional patterns of causes of death, which have a considerable amount of deaths (Van der Veen, 1994). Wolf pointed out that higher mortality rates in certain causes of death in a region do not necessarily mean that this results in general lower life expectancy (Wolf, 1992). Heart diseases, some kinds of malignant neoplasms, some respiratory diseases, car accidents and suicide account for many of the regional differences (van der Veen, 1994).

Some theoretical aspects of regional mortality differentials are now given. Regions usually develop their characteristics, hence also demographic structures, on the basis of historical, geographical, climatic or economic features (de.wikipedia.org 2004). A region is therefore an area belonging together with economic and social structure and serves as a planning base. The NUTS classification (Nomenclature of Territorial Units for Statistics) prefers units according to institutional breakdown, due to practical reasons and regions of a general nature rather than regions of a certain interest.

2.4 Mortality variation by age, sex, and socio–economic group

Age variation. More than half of the life table deaths in men occur beyond age 65, in women beyond age 80. It's trend of highly developed countries, Western Europe, the United States and most part of Eastern Europe. Kazakhstan experienced – as all of the post–soviet countries – an unfavorable change in age–specific mortality in the last century. Infant mortality along with maternal deaths as a measure of public health must be taken into account nowadays.

Throughout the life span, male mortality is higher in each age group. Death rates increase at the age of 15, followed by a slight decrease in the age group of 20–25. Mortality in young adulthood is mostly affected by external causes of death such as car accidents. Up to approximately age 25, this is the leading cause of death. After age 25 death rates exponentially rise.

During the course of life, the pattern of causes of death changes significantly. After age 50–60, cardiovascular diseases (CVD) and ischemic heart diseases play a major role.

Changes in mortality patterns during a lifetime are generally explained by two approaches:

Firstly, lifestyle and behavior have an impact on the occurrence of diseases that lead to death at a certain age. Secondly, several theories of ageing try to explain from a biological point of view the influence of ageing on people's survival (Hayflick, 1994). This also implies the impact of early life events like nutrition that determine mortality later in life (Howe, 1994).

Kuh and others have described an approach that combines the two last mentioned ones and puts special weight on diseases. It is called life course epidemiology. The authors describe it as follows: "A life course approach does not deny the importance of conventional risk factors, such as smoking and hypertension. Life course epidemiology attempts to integrate biological and social risk processes rather than draw false dichotomies between them." Thus, the life course epidemiology tries to explain mortality and mortality differentials during adulthood by factors, which influenced the whole lifespan of humans. The risk factors are for example risk exposure during childhood or early life stages, but also social affiliation can be a risk factor (Kuh, 2003).

Sex variation. Men show higher mortality in all age groups compared to women. It's a non-written rule[1]. This is not only expressed in sex and age specific mortality rates, but consequently in life expectancy. Up to the early 1980s the sex difference in many developed countries was increasing, but then reversed (Glei, 2005). The narrowing gap is considered a convergence in male and female lifestyles. With regard to age-specific sex mortality differentials, the differential is highest for adolescents and young adults (Nolte and McKee, 2004).

[1]There is general conjecture by biological theories that there is a general protective effect of the additional x–chromosome and female hormones. Furthermore, estrogen protects premenopausal women notably from heart diseases. Waldron, Ingrid, 1993. Recent trends in sex mortality ratios for adults in developed counties. Social Science and Medicine. Issue 36. pp451–462.

A comprehensive literature review on why sex differentials in mortality exist was done by Luy who summarized explanatory theories (Luy, 2002). There are basically two main reasons for sex variation. Firstly, because of behavioral and secondly because of biological reasons, similar to what is seen in age variation. Let us first throw a glance at biological factors. The primary sex ratio (sex ratio before birth) is far higher than the sex ratio at birth. This implies that male excess mortality already exists right after conception and remains throughout the whole life span. Many of the leading causes of death exhibit twice or tripled higher death rates of men than women. Also in animals male excess mortality exists throughout the lifespan and is thus not only a human phenomenon.

Behavioral or environmental theories are used to examine sex–specific mortality differences and refer to different lifestyles. Whereas the absolute sex differences in age 1–14 are very low, it increases rapidly after age 15. Men fall victim more often to accidents – the leading cause of death in the young adult ages. Apart from direct risky behavior, smoking habits and diet are considered to contribute much to the gender differential in life expectancy, as are occupational hazards.

Causes of death like lung cancer, accidents and ischemic heart disease (IHD) represent major contributions to the existing sex difference. Higher lung cancer mortality in men is closely related to smoking (Richards et al, 2000). Higher IHD mortality in men is a good example where biological and behavioral factors interfere. It is assumed that female sex hormones produce a protective effect and that men tend to accumulate fat in the abdominal region.

As a consequence, women seem to have a biological advantage in survival. In years it may be one or two years of life expectancy, the remaining gap is become due to environmental[1].

Variation by socio–economic group. Mortality differentials by socio–economic status are well known as a result of poorer health in more deprived groups. Research on mortality differentials very often trace back to socioeconomic differences, for example in regional analyses or in mortality amenable to health care. Four factors make up one's socio–economic status in adult life. These are education, occupation, personal income and employment status. Education can influence health in an indirect way, but also directly, for example by education on smoking and healthy lifestyle. The advantage of education is its steady level after age 25 and easy measurement by counting years of education. Changing school systems and thus different levels of education must be taken into account when comparing mortality by educational level in young and old people. The occupation involves certain occupational hazards that are more pronounced in manual than in non–manual workers. Manual workers are often more exposed to occupational injuries. Specific causes of death relate to certain occupations, for example black lung from coal mining. Personal income allows for a healthier life style, although there are differences dependent on sex. Examination of income level does not necessarily reflect one's wealth, because household income plus savings furthermore earmark the financial situation. Lastly, the employment status accounts for socio–economic differences with unemployed people suffering higher mortality.

Women are often out of the job market in order to be housewives and take care of their children; in this case personal income and employment status do not reflect the socio–economic status. Although some differences between these four factors exist, they are highly correlated.

Education is considered the best indicator of the factors to determine socio–economic mortality differentials, presumably because it influences income and occupation the most (Spijker, 2004).

Vallin describes social inequality as the result of behavior in the following order: selection takes place on the basis of health, with healthy individuals having better chances of acquiring higher education. Living conditions then contribute to a worsening or a preservation of the health status. Finally, he considers behavior itself as a factor, which influences the two aforementioned factors in a positive or negative way (Vallin, 1995). Other risk factors that determine the health status are material factors, psychosocial stress, biological factors and the use of and access to health care (Spijker, 2004). For example, permanent binge drinking leads to a worsening in health status, and at the same time problems at the work place and money troubles may arise. A person will hence hardly be able to maintain its socio–economic status.

Mortality differentials among different socio–economic groups can be allocated to several causes of death. This refers especially to higher mortality from cardiovascular diseases in lower socio–economic groups. Trends in differential mortality due to socio–economic differences are from the cancer, breast cancer, respiratory disease, gastrointestinal disease and injuries (Mackenbach et al., 2003).

Even a rise in mortality rates among lower socio–economic groups could have been found from lung 1980s to the mid 1990s in Western Europe point to a clear fact. Higher socio–economic groups experienced a faster proportional decline in mortality than groups with lower socioeconomic status.

Another important socio–demographic factor, which has an impact on mortality, is marital status. Married people or those who live in a long–term, stable relationship have increased life expectancies. Supporting arguments for their longer life are the protective effect of a regular life and the selective effect that healthier people are more privileged with regard to their chance of getting married (Nusselder, 2000).

2.5 Mortality by causes of death

2.5.1 International Classification of Diseases

Before analyzing and interpreting cause of death statistics, it is necessary to know the recording procedure for causes of death, as it causes some limitations in interpretation and analysis.

Causes of death are coded according to the International Classification of Diseases and Related Health Problems (ICD), currently in the 10th revision. In 1900 WHO first initiated the ICD classification. The classification uses triple digit codes for each cause of death. Triple digit codes are internationally obligatory whereas four–digit codes are only recommended (Schuster, 2003). The fourth digit is a further specification of the triple digit code and indicates for instance more precise types of a disease.

According to WHO, the underlying cause of death is "(a) the disease or injury which initiated the train of morbid events leading directly to death, or (b) the circumstances of the accident or violence which produced the fatal injury" (WHO, 1993). Only the underlying cause of death is recorded in the national statistics (Heinemann and Sinnecker (eds.), 1994). The problem of multimorbidity is hence not included in the classification. It is obvious that the cause of death statistics therefore present only one part of a complex topic. Especially in high ages, it is assumedthat people suffer several diseases. The general accuracy of cause of death statistics and the prevailing coding practice has been addressed in order to assess the quality of cause of death statistics. A famous German study was conducted in 1987 in Gorlitz, an East German city with 80 000 inhabitants where 97% of the deceased were examined by autopsy (Kibele, 2006). The autopsy results were then compared to the death certificates, which were filled out by the attending physician in the East Germany. In 53% of all deaths identical causes were found, in a further 18% of these cases minor differences were observed. Major differences, that is, the crossing of a disease group, were found in the remaining 29 % of cases. Circulatory diseases, endocrine and metabolic dmkg3/kmrders were overrepresented in the death certificates. On the other hand, infectious diseases, neoplasms, respiratory, digestive, and genitourinary diseases were underrepresented (Modelmog et al., 1992).

Several changes took place by each revision of the ICD. ICD 9 – in use in the world practice from 1979 to 1997 – had 17 chapters with 138 groups and was expanded to 21 chapters in ICD 10, which comprises of 261 groups (Schuster, 2003). For the first time in all the revisions, an alphanumeric code was introduced with ICD 10 in 1998. Codes now consist of a letter as the first character and are followed by two or three figures. In ICD 9, codes consisted of three or four figures. The introduction of the alphanumeric code made it possible to expand the number of chapters and codes. As a result, some categories of ICD 9 can be reclassified into several ICD 10 categories (Kibele, 2006).

This leads to a comparability problem between revisions. Some groups underwent major changes in classification. However, 95% of all deaths remained in comparable chapters. As an example for reclassification, respiratory diseases decreased around 25%. This is mostly due to a reallocation of pneumonia, which is now partly within the group of infectious diseases as a result of altered coding rules. Consequently, the group of infectious diseases has risen (Office of National Statistics UK, 2002).

Comparability studies or bridge coding studies deal with this problem and give evidence to what extent changes took place. In England and Wales and the United States, such studies have been conducted by coding the deaths in a certain period to both, ICD 9 and ICD 10.

Comparability ratios were then calculated dividing the deaths of a certain cause in ICD 10 by the deaths of the same cause in ICD 9. If the ratio is one, this means that the ICD revision had no impact on this cause in respect of coding. Ratios greater than 1 indicate a greater allocation of deaths to this cause in ICD 10 than in ICD 9. Those ratios can be applied to the number of deaths

and to death rates in order to get an expected time trend (Anderson et al., 2001). A comparable study for Kazakhstan is not known.

As such comparability studies do not exist, for example, for France; Vallin J. invented another approach to solve the problem of breaking time series. He and his colleagues matched causes of death from different ICD revisions and elaborated correspondence and transition tables. In the easy case items either remain the same, have to be split up or merged. A more complex case emerges when causes have to be both split up and merged. With the help of the transition tables, diseases can be classified from one classification to the other and vice versa (Vallin, 1996).

Differing regional coding practices make comparisons difficult. This example can be applied to the situation of East and West Germany before their Unification in the 1990. East Germany adapted the West German coding practice on October 1st, in 1990. Before, physicians were responsible for ICD coding.

The similar situation was in the USSR countries, because the soviet practice had its own coding of diseases. After the collapse of the Soviet Union International coding of diseases were taken as the model in all countries of the post–soviet space. The WHO coding practice determines that physicians fill in a death certificate, actual coding is done by personnel at the State Offices of Statistics. In Kazakhstan, actual coding is checked by personnel of the regional departments of the Ministry on Health.

In 2003, a modern death certificates were elaborated by the Ministry on Health. 2 different certificates wee adopted: a) a death certificate; b) a perinatal death certificate. International coding of diseases led to death named only in the first case. Only in the case of traumas and poisoning, primary cause of death, ICD code and data of beginning and ending of disease (day, month, and year) name along with external causes of death and their coding. So, in the case of death because of trauma must be pointed out a sharp localization, state and characteristic of trauma. In given points the chain of the causes led to death would be written. Final point would contain the external cause of death.

The example below refers to the instructions of the Certificate of death.

ii) a) Traumatic hypostasis of a brain
b) Simple fracture of a skull base
c) Assault on the street with use of dull item.

ii) The basic cause of death would be written as “Fracture of a skull base, simple” with code – S02.10.

Simultaneously, the second code – Y00.4 would be posted. It is code of external cause of death “Assault on the street with use of dull item” (See Appendix 3).

It assumes that instead of choosing the underlying cause of death, the final state of a disease was often chosen as cause of death (Dinkel, 2004). For example, diabetes mellitus and pneumonia often occur as a disease, but they are rather final state than the underlying cause of death. As for differential cause of death statistics, Dinkel advises against “excessive interpretation”. Other

demographers, such as Luy come to the conclusion that the analysis of cause of death structure is not reasonable for the time of the country's transitive period (Luy, 2004).

Further restraints regarding cause of death statistics are the implementation of new diagnostic methods and diagnostic fashion, which is the occasional preference of certain diseases. In addition, differing autopsy rates may influence cause of death statistics by the correction of under and over registered causes of death (Heinemann and Sinnecker (eds.), 1994).

2.5.2 Major groups of causes of death

Diseases of the circulatory system, cancer, respiratory and digestive diseases plus external causes of death are the five predominant groups of causes of death in Kazakhstan. Approximately 90 % of all deaths are assigned to these five groups.

The predominance of external causes of death in adolescence is followed by cancer in the middle adult age groups and by cardiovascular diseases in older adult ages. While respiratory diseases gain in importance after age 45, diseases of the digestive system are also more common among the middle ages.

Circulatory diseases account for about 50% of all deaths in women and for around 40% in men. Resulting diseases that belong to the class are ischemic heart diseases (IHD) and cerebrovascular disorders. Among IHD there are arthroscleroses and myocardial infarction; stroke constitutes a major part of cerebrovascular disorders. These diseases usually occur in adult ages. Myocardial infarction constitutes the most frequent single cause of death where a coronary artery is concluded. The majority of the patients have symptoms such as angina pectoris some time before the infarction takes place. The lethalness from a heart attack is high, especially in the time right after the occurrence (Anderson, 1997). Stroke, also called apoplexy, belongs to the group of cerebrovascular disorders and is characterized by an immediate cerebral circulatory disorder. Because of their higher general life expectancy, women are more affected by strokes (ibid.).

Unchangeable risk factors for CVD are age and sex. Common behavioral risk factors are poor diet, smoking, excessive alcohol consumption, physical inactivity and psychosocial factors. They may lead to obesity, high cholesterol level, hypertension and diabetes and then lead to the "cardiovascular endpoints" like coronary heart disease, myocardial infarction, stroke and congestive heart failure (Mamun, 2003). Prevention is possible with regard to behavior as the risk factors are widely known. Though excessive alcohol consumption is a risk factor, moderate alcohol consumption has a protective effect on CVD mortality. This holds true especially for France and is part of what is known as the French paradox (Spijker, 2004). Risk factors not only exist at adult ages, malnutrition even during gestation for example leads to higher risk of IHD in adult ages (ibid.).

On the second rank of prevalence, there are malignant neoplasms. Within the group of malignant neoplasms, lung cancer constitutes the biggest share in men and breast cancer in women. Many different risk factors form the etiology of cancer. It is assumed that 80% of all cancers may be caused by behavioral and environmental factors (Becker, 2005). Risk factors are for example

smoking, congenital conditions, radiation, exposure to asbestos or dietary habits. Increasing cancer incidence at increasing ages is considered a combination of an accumulated influence of carcinogens as well as longer exposure time due to higher life expectancy. Apart from a healthy life style and avoidance of other environmental exposures, the prevention of cancer is rather difficult. For breast cancer, it is thought that early first pregnancies as well as long periods of lactation have a protective effect. In general, screening programs try to intensify early diagnosis and better chances of survival through early treatment. This applies for instance to breast cancer, cancer of the cervix and, to cancer of prostate (ibid.).

Recent studies on cancer survival show that cancer survival is enhanced and mortality rates are decreasing in certain cancers. Better treatment and screening have led to a reduction of death rates especially in breast cancer, cancers of the colon, rectum and bladder and skin cancer (Rogers et al., 2000).

Diseases of the respiratory system comprise of, among others, influenza, pneumonia and chronic lower respiratory diseases. They are characterized by airflow obstructions. Pneumonia is another severe disease, where mostly old people and people with general bad health are affected. Respiratory diseases constitute not the only group where the Western Kazakhstan has a higher mortality in comparison with whole republic. Smoking, environmental pollution, dust exposure at work, infections and inheritance are the most common risk factors (Becker, 2005).

Digestive diseases account for a certain amount of deaths in the middle adult age. This is because of the composition of diseases. Especially amongst men, diseases of the digestive system are dominated by chronic liver disease. As digestion constitutes a large process, many organs are involved, for example the esophagus, colon and rectum, pancreas and stomach. A balanced diet is recommended in order to prevent digestive diseases.

Infectious and parasitic diseases in the Caspian region have a significantly large part in the range of the other causes of morbidity. The potential death risk is the morbidity by tuberculosis which in the leading position as in the rural and urban areas.

Chapter 3

Data and Methods

3.1 Data collection and sources

The present work focuses on regional analysis. In European politics, "a region is the layer of government directly below the national level" (en.wikipedia.org, 2004). In Kazakhstan practice is often used the 2 common definitions of the word. The first one is a specific district or territory used in its territorial and administrative meaning, and the second one is "an area of the boy having naturally or arbitrarily assigned boundaries" usually used socio–economic and geopolitical context (www.stat.kz, 2008).

When applying the last definition to Kazakhstan, the term region refers to the regions of Kazakhstan, one of them being the Caspian region. Strictly speaking the Caspian region does not relate to level 1 of the NUTS classification (Nomenclature of Territorial Units of Statistics of the RK). As I said previously, the Caspian region does not exist in territorial and administrative sense, this level presents by two oblasts: Atyrau and Mangystau regions. The subsequent level NUTS 2 then refers to urban and rural districts. The Caspian region has seven urban and 5 rural districts with an average size less than 10 000 inhabitants. Analysis level of this study is mainly regional level. In addition, the population size and main demographic indicators of the Republic Kazakhstan as total are used for comparisons. It depends on the fact that the Caspian region is the unique region within Kazakhstan which must be specified and studied not within the adopted administrative and territorial division but in consequences of its natural and socio–economic boundaries.

National Agency on Statistics of the Republic of Kazakhstan provided data on population size on regional level (NUTS 1) for the period 1991–2009 as of 31st December of the referring year.

And this work mainly based on the data describing period from 1999 till 2008 because of its availability and comparability. This question will be highlighted in the following subchapter. In short, the data from the date of Independence till the end of the last century is of low quality and data for some years is absent or provide irrational and unreliable information. From the census taken part in 1999, data was scrutinized and counted back until 1996. But in spite of this an

aggregated data of the West part of Kazakhstan is available only for the mentioned years onwards. Mid–year population was obtained from the data of the Agency of Statistics of the RK. Data is available up to age group of 85+.

Numbers of deaths for the Kazakhstan could also be retrieved from the HWO for the years 1981–2006. But data for 2 years – 1982 and 1983 is not available. Data is available in single age groups up to age 110. For Kazakhstan, numbers of deaths by causes of deaths could also be retrieved from WHO for the mentioned years. The Ministry on Health of Kazakhstan issued Order #551, February 1, 1996 "Concerning ICD–10 implementation in the Kazakh Republic" to ensure data comparability both at country and international level, and also to implement WHO recommendations. By this Order, ICD–10 was implemented by Health Care Facilities from January 2001. In accordance with this Order, all reporting forms concerning morbidity had been revised by the middle of 1997 in that the column ICD–10 was added to the column ICD–9. Interim coding had been done during the three years of 1997–1999. Recently, the onwards–reporting forms had been further revised and the column for ICD–9 deleted. From 2001, Kazakhstan had made the transition to the coding of death causes in accordance with ICD–10. The Agency on Statistics had carried out workshops on ICD–10 for specialists at national and oblast levels.

The problems occurred with the comparability of deaths within the mentioned period. The list of causes of deaths which shown in the appendix, Table 1 displayed the list of four–digit codes from 1981–2002, and for the years from 2003 till 2006 the coding is in three–digit codes. Data of deaths by causes of deaths for the period from 1981–2003 is coded in ICD 9; Kazakhstan introduced ICD 10 coding in 1998. In soviet period Kazakhstan, as the other republics of the USSR used the overall Classification of Diseases adopted in 1968. This Classification was different very much from the recent system of coding in spite of the fact that it was established by the overall rules of the WHO.

Data on causes of death coded in ICD 9 and ICD 10 were recoded into ICD 10 main groups and subgroups according to a list provided by the Eurostat (European Communities, 2002). The selection list is shown in the annex (see appendix 2).

Socioeconomic indicators like the number of physicians, unemployment rate and others were taken from the Statistical Yearbooks for the years 1999–2008 (Agency on Statistics of the RK, 2005–2008). All indicators are standardized for population size, e.g. by giving indicators per 100 000 inhabitants.

A national register of population was created as a result of which each citizen will be given a 10–digit code. The individualized database on each death case in the territory of Kazakhstan was now maintained in the Agency, and included records since 1996. The transfer of data to electronic format and coding of each death case was done by the oblast department of statistics using data received from district's departments of statistics.

The data for the thesis are compiled in a national vital statistics registry maintained by the Agency on Statistics of the Republic of Kazakhstan. All vital events are required by law to be reported to local authorities, who then submit reports that are compiled at the district level. The officials in districts then report data to the oblast authorities, who in turn submit data to the national

Agency on Statistics, which maintains a computerized database, and can calculate vital event rates in extraordinary detail. Common forms are used at all levels (See Appendix 3). Vital events are attributed to a person's region of residence, rather than to where the event actually took place, in the event that these two locations differ (www.stat.kz).

For each vital event recorded, the person's age, gender, residence, ethnicity, broadly defined occupation and educational attainment are noted. There is in principal no restriction on this information, but manpower constraints limit Agency's ability to carry out highly disaggregated analysis. At present, most technical expertise is devoted to correcting obvious errors in local reports and data entry, in re–computing time series to reflect new oblast boundaries, and to provide detailed migration data. When provincial boundaries are changed, as in 1997, the National Statistical Agency recalculates population and vital events for past years using the new boundary definitions.

Despite of the Agency's level of professionalism, it is impossible to correct all local reporting errors. In the case of recording deaths, families of deceased persons of working age have incentives to report such deaths, because they become eligible for survivors' benefits from the state Solidarity pension system. Conversely, families of elderly or disabled persons have an incentive not to report deaths because of already receiving pensions. However, many disabled people and rural pensioners receive pensions directly in person from authorities, making deception difficult, and the Solidarity system also provides a burial payment to survivors.

While many urban pensioners receive automatic deposits into savings bank accounts, estimates of a large number of ''dead souls'' has led the National Pension Agency to crack down on cases of suspected fraud, and the problem appears to have diminished greatly. The main errors in mortality statistics, then, have to do with proper attribution of cause of death, and estimates of population and deaths of unregistered immigrants. By restricting analysis to broad categories, by focusing on non–infant mortality (since infant and child mortality estimates tend to have the greatest errors), and by considering only urban populations, cause of death errors are likely to be kept small. Medical examiners are supposed to record causes of death, and for various external causes, and most infections, sudden deaths, and deaths following prolonged illnesses, the broad category is fairly clear (Becker and Urzhumova, 2005).

In view of the foregoing, we can see that the statistical offices in Kazakhstan quickly make adjustments in their early assessment of the extent of new information, which collected more accurate. More accurate indicators of the average population in turn allow more accurate assessment of such an important indicator as GDP per capita. Adequate representation of the population and its structure is in the particular importance for the development of social policy, as well as for demographic forecasting and understanding of the prospects for country's economic development.

3.2 Methods and measures for mortality analysis

In order to calculate life expectancy, life tables were calculated based on population and mortality data in 5–year age groups up to age 85+ (0–1; 1–5; 5–10; …; 85+). Formulae were adapted from

Preston and colleagues (Preston, 2001). Fractions of age intervals *x n a* were retrieved from the Czech life tables (2006), provided by the Czech Statistical Office and the Department of Demography and Geodemography of the Charles University in Prague. (czso.cz, 2002).

Confidence intervals of life expectancy were calculated using the formulae for the sample variance of life expectancy proposed by Chiang (1984, p. 163):

$$S_{e\alpha}^2 = \sum_{i=\alpha}^{w-1} p_\alpha^2[(1-a_i)n_i+e_{i+1}]^2 S_{pi}^2 \text{, whereas } S_{pi}^2 = \frac{q_i(1-q_i)}{P_i}.$$

To test whether two life expectancies significantly differ from each other, a test was conducted.

Null hypothesis is H_0: $e_0(1) = e_0(2)$ and alternative hypothesis H_0: $e_0(1) \neq e_0(2)$. The critical ratio CR is computed by the formula:

$$CR = \frac{e_0(1) - e_0(2)}{(S_{ei}^2(1)+S_{ei}^2(2))^{-1}}.$$

Normal distribution is used and hence the critical ratio compared to 1.96 and 2.33, the 95% and 99% significance level (Chiang, 1984).

Standardized death rates (SDR) were calculated using the European Population Standard proposed by the Eurostat (European Communities, 2002) with its given population share up to age 85+. The SDR is a method of direct standardization and states the level of mortality, which could be expected if the observed population had the same age structure as the standard population. Since the European Population Standard is a unisex standard, it can also be used to compare among sexes.

Decomposition of differences in life expectancy by age and cause of death was applied using the formulae presented by Andreev (Shkolnikov et al., 2001). Advantage of decomposition of life expectancy is the weighting of age groups so that younger age groups have higher impact on the remaining life expectancy than older age groups. Nusselder and Mackenbach explain this fact that "(1) only a small proportion of the population is exposed to changes in mortality rates at advanced ages, as not everyone survives up to these ages and (2) the remaining life expectancy at older ages is much smaller, reflecting the high risks of mortality at older ages" (Mackenbach, 2000). Positive and negative deviations are possible whereas a positive value indicates that population 1 has a higher than population 2 and vice versa.

Contributions – negative and positive – of all age groups are sum up to the total difference observed in life expectancy. Decomposition is based on life tables up to age 85+.

Cause–specific mean age at death was calculated using life table populations. The weighted sum of all cause–specific mean ages at death result in the life expectancy as derived from life tables. The detailed explanation and formulae were discussed by Scholz and Schott. Cause of death data was available up to age 85+ and the death rate for ages was applied in the life table application.

Analysis of factors that influence life expectancy was undertaken for the time points 1999–2003 and 2004–2008, as well as for the factors of change between 1999–2003 and 2004–2008. A low

quality of data and its reliability does not permit the use of earlier data; population data on regional level was only available from 1999.

3.3 Problems of analysis

An important issue is the improvement of births and deaths registration, as well as the quality of mortality data. Within the last two years, systematic checking of the quality of registration had been recommenced with the support of International Organizations and internal sources.

Unfortunately, the quality of demographic statistics in the post–Soviet countries has fallen sharply compared to the Soviet period. Kazakhstan formed as a resettlement area experienced a massive outflow of population and its intensity have been diminished by the end of the 1990s with positive gain in 2003.

Nevertheless it's difficult to assess the dynamics of Kazakhstan's population during 1990s. In February 1999 there was conducted a nationwide census, the results made serious alterations in previous official estimates that were overestimated.

Comparison of the preliminary results of the census conducted by the UN standards with the earlier official estimates showed that at the beginning of 1999 the resident population of Kazakhstan did not touch 15 million people. It is about half a million fewer than previously believed. The census recorded the resident population at 14 million 953 thou. and the actual population – 15 million 49 thou. people (Musabek, 2001). Since the previous census in January 1989 the resident population of the country declined by 1.247 thousand people or 7.7 %.

Simple calculations show that at the beginning of 1999 the resident population of Kazakhstan was approximately 14.970 thou. and actual is about 15.060 thou. people. In that case it is difficult to give relatively accurate adjustment of the mid–year population. So, there are two factors that may cause the differences between census data and regular annual evaluations of the population. First, an incomplete account of emigration, and secondly, the inflated estimates of natural population growth.

In the former USSR, Kazakhstan occupied an intermediate position between the Slavic and Central Asian republics with close tendency towards first. In comparison with Russia, Kazakhstan has a large proportion of non–urban population as well as youth.

In 1979–1989 the population growth in Kazakhstan was almost three times higher than in Russia. In early 1990s the population growth in the Republic of Kazakhstan due to relatively higher fertility and lower mortality also was higher than Russia's (see Table 2). Comparison of two series of indicators for Kazakhstan for the years 1991–1999 in Table 2 allows to understand the nature of refinements made to the demographic statistics after the census. Both mortality and fertility rates were increased in such a way as to reach the higher level of natural population growth. If the first adjustment is justified, then the second raises some doubts. The very logic of the adjustments can hypothetically assume that the outflow of population in the 1990s has been significantly underestimated in official statistics. At the same time, it appeared that in 1992–1994 official

statistics of Kazakhstan, on the one hand, somewhat overestimated the fertility rate, on the other hand, contrary to underestimated mortality. In Russia in that period both indicators, particularly mortality, changed abruptly. Only at the end of 1998 Kazakhstan indices became closer to Russia's.

No matter how arbitrarily is this comparison, but the scale and intensity of the Kazakh population experienced the shock is unlikely to have been less than in Russia. In a certain degree the socio–economic and psychological stress in Kazakhstan was even stronger. It is logical to assume that the rate of population reproduction in the two countries have to vary more or less parallel.

Table 2 – Basic indicators of population development in Kazakhstan and Russia per 1 000 peoples in 1979–1998

Years	Kazakhstan			Russia		
	Natural growth	**Births**	**Deaths**	**Natural growth**	**Births**	**Deaths**
1979	16.3	24	7.7	5	15.8	10.8
1980	15.9	23.9	8	4.9	15.9	11
1981	16.4	24.4	8	5.1	16	10.9
1982	16.5	24.4	7.9	5.9	16.6	10.7
1983	16.5	24.5	8	6.4	17.5	11.1
1984	17.2	24.5	8.3	5.3	16.9	11.6
1985	17.1	25.5	8	5.3	16.6	11.3
1986	18.2	25.1	7.4	6.8	17.2	10.4
1987	18.1	25.6	7.6	6.7	17.2	10.5
1988	17.1	24.8	7.7	5.3	16	10.7
1989	15.4	23	7.6	3.9	14.6	10.7
1990	14	21.7	7.7	2.2	13.4	11.2
1991	13.01/13.42	21.0/21.6	8.0/8.2	0.7/0.7	12.1/12.1	11.4/11.4
1992	11.8/12.2	19.9/20.6	8.1/8.4	-1.5/-1.5	10.7/10.7	12.2/12.2
1993	9.4/...	18.6/...	9.2/...	-5.1/...	9.4/...	14.5/...
1994	8.6/9.1	18.2/19.0	9.6/9.9	-6.1/-6.1	9.6/9.6	15.7/15.7
1995	6.5/6.8	16.7/17.5	10.2/10.7	-5.7/-5.7	9.3/9.3	15.0/15.0
1996	5.5/5.6	15.9/16.3	10.4/10.7	-5.3/-5.3	8.9/8.9	14.2/14.2
1997	4.5/4.8	14.7/15.2	10.2/10.4	-5.2/-5.2	8.6/8.6	13.8/13.8
1998	4.4/4.6	14.3/14.8	9.9/10.2	-4.8/-4.8	8.8/8.8	13.6/13.6
1999	.../4.3	.../14.0	.../9.7	.../-6.4	.../8.3	.../14.7

[1] Estimates before the Census in 1999
[2] Estimates after the Census 1999
Source: Demographic Yearbook of the USSR, 1990; Statistical Yearbook of the CIS countries, 1999

Yet the main cause of population decline in Kazakhstan is not so much deterioration of reproductive patterns, as the emigration of Russians, Germans and others. According to very approximate estimates, the decline was due to emigration from two–thirds to four fifths of the population. And it is impossible to spread this chaotic process for years with satisfactory accuracy.

However, based on official statistics on migration, we can again very rude to determine that two–thirds of the identified census population losses – losses on the previous official estimates – were in the first half of the 1990s. If so, then at the beginning of 1996 the resident population of Kazakhstan was 16 125 000 people. Another way to adjust the official estimates is a retrospective deploy of the statistical series, based on the census of 1999 and the official rate of population growth for 1991–1999. The second method is exactly more accurate than the first, because it is obvious that in 1995 the population was declining, not rising.

These very rough estimations of the dynamics of population in Kazakhstan through 1990s are very close to official estimates released in late 2000s. Statistical services of Kazakhstan are based on the smoothed migration dynamics and, apparently, used the adjusted birth and death rates. It gives the opportunity to avoid the sharp differential in population size of mid 1990s.

Musabek on 6th CARINFONET meeting on cooperation in the field of health statistics and information in October 2001 reported on the extensive study that had been carried out on the registration completeness of natural demographic changes. This study revealed an under–registration of both births and deaths, and the actual population figure had been calculated. This resulted in a Presidential Decree indicating measures to revise the causes. "New rules for citizens domiciliary registration" were adopted, and as a result an additional 50 000 people were registered in Astana alone. A similar exercise in all oblast centers were conducted in the next year. The migration police was established for the control of demographic changes and the law on matrimony and family was elaborated (CARINFONET, 2002).

Small numbers of population and deaths are a common problem of all small–area analyses. This applies to the small–area analysis on district level within the region where population size differs between 200000 inhabitants in Atyrau and 50000 in Zhanaozen. Therefore, the life table calculations were performed using 5–year periods. Still, some districts do not exhibit deaths in certain years in some very young age groups. The analysis on causes of death within the region was done – according to data availability – for the period of 1999–2008. But the subdivision into causes of death leads to a reduction of number of deaths.

Differing definitions of live births between Kazakhstan and European community have been described in chapter 2.2 with regard to recent mortality situation. For time series analysis, another change of definition has to be mentioned. In April 2007, a further change in definition of live birth took place in Kazakhstan. Before, stillborn children with birth weight below 1000 g were defined as miscarriage. After the change of definition, stillbirths are now newborns without one of the three life signs: heart beat, breathing and pulsating umbilical cord with birth weight below 500 g (2008).

The transition from ICD 9 to ICD 10 led to several reallocations. Table 2 displays so–called comparability ratios (CR) of several selected causes of death. The comparability ratios presented in this work are based on coding the same deaths occurring in 1996 by both the Ninth and Tenth Revisions and measure the net effect of ICD–10 by cause of death, presented by Table 2. Operationally, the comparability ratio for cause of death *i* (*Ci*) is calculated as:

$$C_i = \frac{D_{i,ICD\text{-}10}}{D_{i,ICD\text{-}9}}.$$

where $D_{i,ICD-10}$ is the number of deaths due to cause i classified by ICD–10 and $D_{i,ICD-9}$ is the number of deaths due to cause i classified by ICD–9. A comparability ratio of 1.00 indicates that the same number of deaths was assigned to cause i under both ICD–9 and ICD–10 denoting no net effect of ICD–10 on that particular cause of death. A ratio showing perfect correspondence between the two revisions does not necessarily indicate that the cause was totally unaffected by ICD–10, but merely that any increases in the allocation to cause i were completely offset by decreases in the allocation to cause i.

Table 3 – Transition of selected causes of death from ICD 9 to ICD 10

Chapter	ICD–9 chapter titles (code range)[1]	Chapter	ICD–10 chapter titles (code range)[1]	Comparability ratio
I	Infectious and parasitic diseases (001-139)	I	Certain infectious and parasitic diseases (A00-B99)	0.8547
II	Neoplasms (140-239)	II	Neoplasms (C00-D48)	1.0068
VII	Diseases of the respiratory system (390-459)	IX	Diseases of the respiratory system (I00-I99)	1.0435
VIII	Diseases of the respiratory system (560-629)	X	Diseases of the respiratory system (J00-J99)	1.0478
IX	Diseases of the digestive system (580-629)	XI	Diseases of the digestive system (K00-K99)	1.0367
XI	Complications of pregnancy childbirth and the puerperium (630-676)	XV	Pregnancy, childbirth and the puerperium (O00-O99)	1.106
XVII	Injury and poisoning (800-999)	XIX	Injury and poisoning and certain other consequences of external causes (S00-T98)	1.0303
–	na	XX	External causes of morbidity and mortality (V01-Y98)	–
–	na	XXI	Factors influencing health status and contact with health services (Z00-Z99)	–
–	Supplementary classification of external causes of injury and poisoning (E800-E999)	–	na	–
–	Supplementary classification of factors influencing health status and contact with health services (V01-V82)	–	na	–

[1]The fourth digits of the upper and lower limits of the code ranges are not shown
Source: Anderson et al, 2001

A comparability ratio less than 1.00 results from fewer deaths being classified to cause i under ICD–10 compared with the comparable cause under ICD–9. For example, the preliminary comparability ratio for Viral hepatitis is 0.8343. In ICD–9, 1,346 deaths were classified as Viral hepatitis. In ICD–10, when the same deaths were classified, the number of deaths due to Viral hepatitis fell to 1,123, a decrease of 223 deaths or about 16.5 percent. This means that Viral hepatitis was less likely to be selected as the underlying cause of death in ICD–10 than in ICD–9. Comparability ratios greater than 1.00 are the result of a larger number of deaths being classified to cause *i* under ICD–10. For example, the comparability ratio for Septicemia is 1.1949. In ICD–9, 17,791 deaths were classified to Septicemia. In ICD–10, 21,258 deaths were classified to Septicemia, an increase of 3,467 deaths or nearly 20 percent. Thus, Septicemia is more likely to be selected as the underlying cause of death in ICD–10 than in ICD–9 (Anderson et al, 2001).

There is some evidence that coding practices differ regionally. For example, during the survey made by the Statistical Office of Germany was found that cardiovascular mortality has been remarkably higher in the GDR and cancer mortality has been lower than in FRG. After adoption of the West German coding practice this difference diminished and differences are no longer found (Dinkel, 2002). This has to be taken into account when evaluating cause–specific mortality data.

The critical attention must be paid also to the selection and grouping of avoidable causes of death which could differ from one study to another. Direct comparability to other studies is therefore not always given. Primary and secondary prevention are sometimes both adequate for a certain cause of death (Nolte and McKee, 2004). Age limits set could be adopted following Nolte and colleagues (Table with all avoidable causes and age limits are shown in the annex, Table A 4).

Both sexes have the same age limits, mostly age 74. Naturally, this does not reflect reality, but no better solution has yet been found and agreed. It is important to mention that this gradation is not practiced in the CIS countries. The selected causes of death are presented in annex, Table A 1. For example, the analysis of the whole group of cardiovascular diseases is not possible. Attention has to be drawn at ecological fallacy when analyzing the relationship between mortality level and socio–economic indicators on aggregate level. Statistical relationships may indicate interdependences, which do not exist on individual level (Rosen et al. 1985). Therefore the indicators for an ecological analysis have to be chosen with a big care.

Chapter 4

Mortality patterns in the Caspian region and comparison with Kazakhstan

The mortality of the Caspian region is analyzed over time and compared to the mortality of the Kazakhstan as a whole. In spite of the fact that the mortality level is informative only within the context of development over time and the comparison to other regions, the current work describe the differences on the regional level by comparing the local indicators to the corresponding ones of the national level. In this sense we must say some words about this regional composition. As seeing from Figure 2, the western part of Kazakhstan territorially and administratively constitutes Western Kazakhstan, including Aktobe, West-Kazakhstan regions and two oblasts of the Caspian region: Atyrau and Mangystau.

Figure 2 – Regions of the Republic of Kazakhstan

Source: Demographic Yearbook, 2008

As seen in table below and from table 5 in the appendix 2, the number of deaths within Kazakhstan and within the Caspian region is not decreased during the time. Increase of mortality during the analyzed period are documented by total deceased number indicators value increase of approximately 147 000 persons in 1999 to more than 153 000 persons in 2008 for Kazakhstan and slightly increase from 6402 till 6883 deaths respectively in the Caspian region. However, total number of deceased persons as well as crude death rate is influenced by age and sex structure they can not characterize the development of mortality adequately. The effect of age structure could be eliminated by means of using standardized death rates. As seen from given table if in 1999, there were 8.5 deaths in the Caspian region, then in 2008 this indicator was 7.2 deaths per 1 000 persons. So, this simple procedure of standardization of death rates shows us that despite the increase in absolute numbers of deaths, the SDR is slowing down for the Caspian region as well as for Kazakhstan (see appendix 2, table 5).

Table 4 – Mortality characteristics of the Caspian region, 1999-2008

Indicator		1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Number of Deaths		6402	6337	6510	6742	6672	6577	6677	6960	6894	6883
Crude Death Rate		8.5	8.3	8.5	8.6	8.4	8.1	8.0	8.1	7.8	7.5
Standardized Crude Death Rate[1]		8.5	8.3	8.4	8.5	8.2	7.9	7.8	7.8	7.5	7.2
Life Expectancy at birth	**Men**	58.7	58.8	58.2	58.5	59.6	59.7	60.1	60.1	60.6	62.1
	Women	69.5	70.0	70.3	70.2	70.7	71.4	71.6	71.7	72.2	72.4
	Difference	10.8	11.2	12.1	11.7	11.1	11.7	11.5	11.6	11.6	10.3
Life Expectancy at 60	**Men**	12.3	13.0	12.7	12.4	12.4	12.9	12.7	12.5	12.9	13.5
	Women	17.0	17.1	17.5	17.2	17.1	17.5	17.8	17.7	17.9	18.6
	Difference	4.7	4.1	4.8	4.8	4.7	4.5	5.1	5.3	5.0	5.1

[1] Standard - Population age structure as 1.7.1999.
Source: Own calculations based on data of the Agency on Statistics of RK (unpublished data)

In chapter 4.1, an overview of the general mortality and life expectancy trend from 1999 till 2008 is given by comparing the Caspian region to the Kazakhstan as well as Western Kazakhstan to the whole Kazakhstan. This development is supplemented by an age-specific description in chapter 4.2.

4.1 General level of mortality and length of life

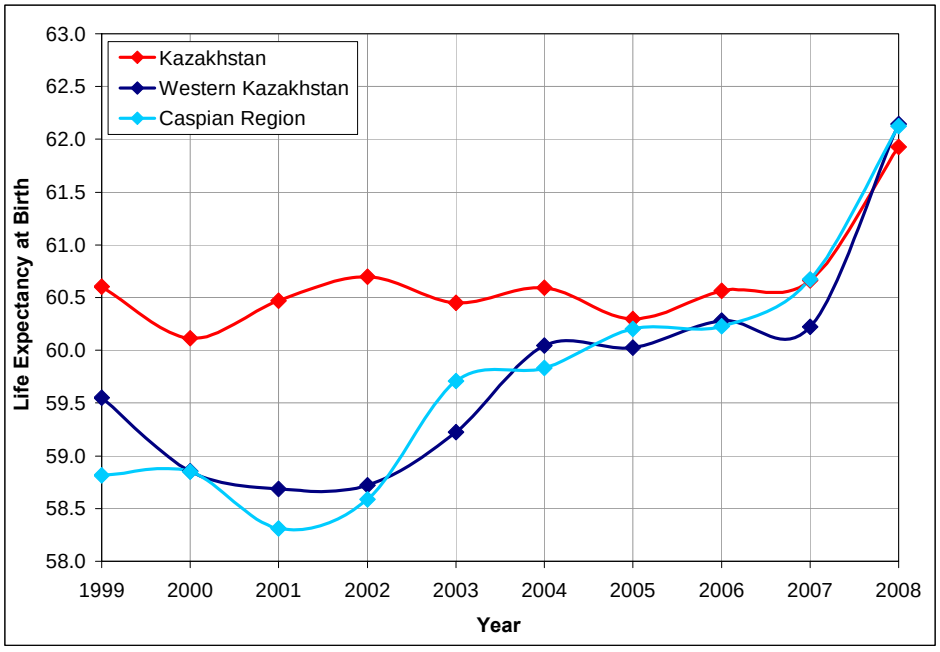
Life expectancy in Kazakhstan is fairly low: sixty-one years for men and seventy-two years for women in 2008, according to the World Health Organization (www.who.int, 2008). Healthy life expectancy at birth in 2002 was 52.6 years for men and 59.3 years for women, now it is slightly increase to 53.5 years and 61.2 years respectively. Under-five child mortality in 2008 is eighty-three per 1000 live births for males and sixty-two for females. Different agencies within the country report different numbers for maternal mortality, and there are to date no official statistics. The

Kazakhstan Ministry of Health reports that there were 75.8 deaths per 100000 live births in 1990, while the Agency for Statistics reports fifty-five. Both groups report a decrease between 1990 and 2008, to 36.9 deaths per 100000, although the number is still considered unreasonably high, particularly in light of the fact that nearly 100% of births in Kazakhstan are attended by health professionals. This indicates an issue with the quality of obstetric care.

It is obvious, that the changes in life expectancy could influence the rates of death positively or negatively. So, Kazakhstan is not an exception. Mortality has increased substantially in the Caspian region in the examined period from the early 1999s until 2008. It is important to notice that mortality patterns are not surprisingly rise in the beginning of the 21st century. As it mentioned above, this mortality patterns were developed steadily during the whole period of independency. Existing discrepancy is much due to the quality of data and its availability. As the other countries of the post-Soviet area, Kazakhstan had a weak and unreliable data for some years which related to the specifics of the country's development in the early 1990s. It is interesting to notice that the indicators concerning general mortality level and life expectancy for the post-Soviet republics deteriorate with the collapse of the USSR, at the same time breakup of the Soviet Union led to increase of main demographic indicators in the countries of the Eastern Europe, for example, in former Czechoslovak Republic.

Since the 1990s the collateral of mortality – life expectancy – increased during this time by more than five years in men and six years in women. The Caspian region as the part of Kazakhstan experienced the similar trend. The life expectancy for men is about 60.2 and 71.3 years - for women in Mangystau region and 61.4 for men and 71.6 years for women - in Atyrau region, which correspond to the Kazakhstan's average 61 years for men and 72 years for women (2008).

Figure 3 –Trend in life expectancy at birth in 1999-2008, males

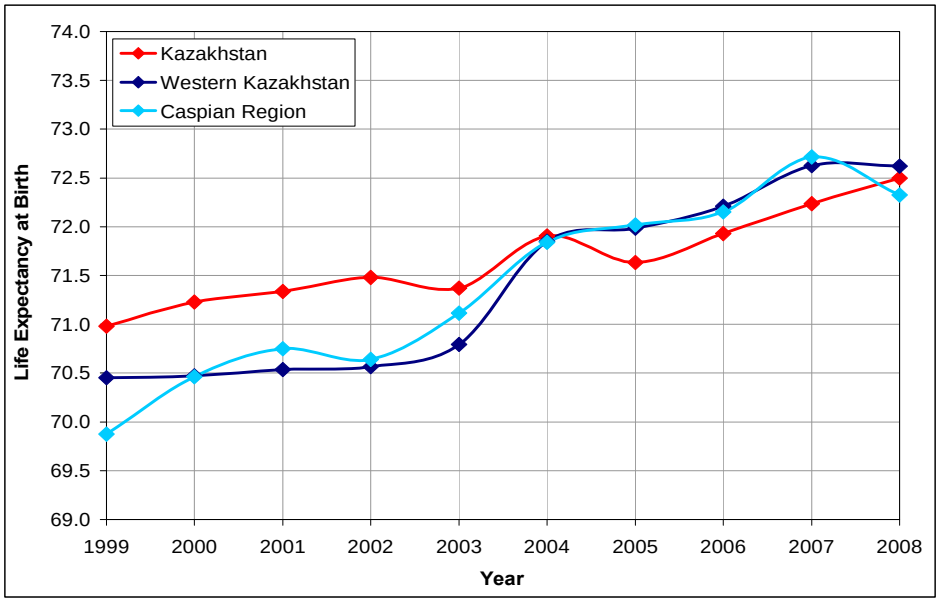


Source: Own calculations based on data of the Agency on Statistics of RK (unpublished data)

The general pattern of life expectancy can be described as follows, and as seen in Figure 3 and Figure 4. The Caspian region is running at the average of the life expectancy trend, and in the same time, it exhibits the highest mortality.

Figure 3 and Figure 4 show life expectancy at birth by region and gender in absolute numbers.

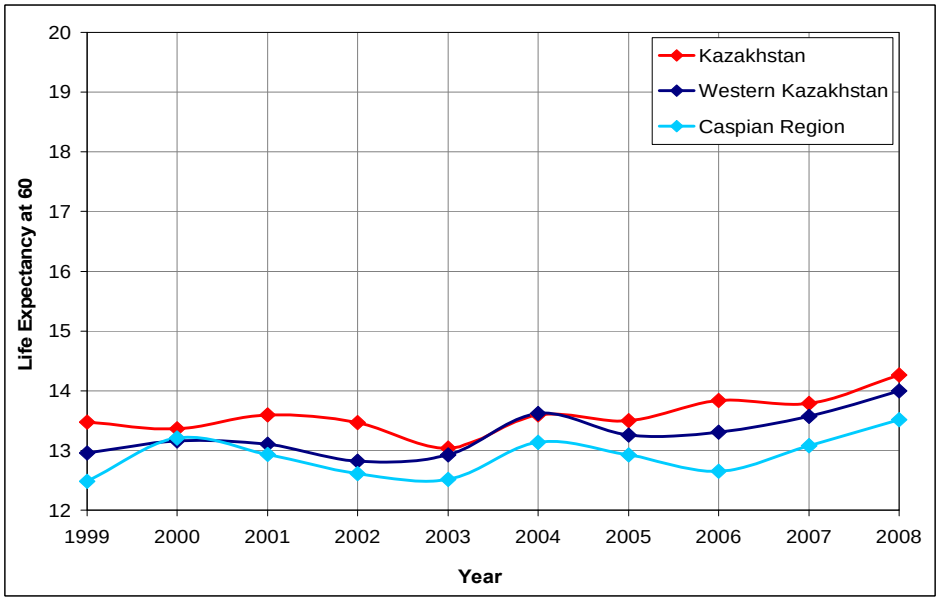
Figure 4 – Trend in life expectancy at birth in 1999-2008, females



Source: Own calculations based on data of the Agency on Statistics of RK (unpublished data)

According to Figures 5 and 6, presented life expectancy at 60 years for both genders, we can see the stable increase in the number of remaining years for all mentioned levels.

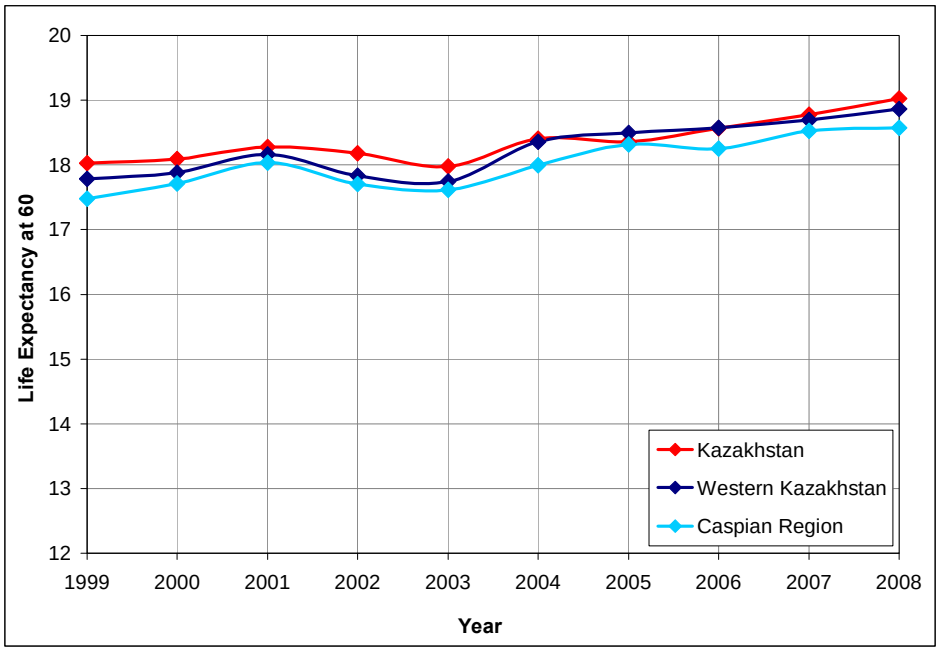
Figure 5 – Life expectancy at age 60 in 1999-2008, males



Source: Own calculations based on data of the Agency on Statistics of RK (unpublished data)

Over the observation period Kazakhstan males live in average shorter than women about 5.5 years. It's interesting; that the increase in life expectancy at 60 years in Kazakhstan for both sexes has began recently, while the period after breakup of the Soviet Union was characterized by the loses in life expectancy for both sexes.

Figure 6 – Life expectancy at age 60 in 1999-2008, females



Source: Own calculations based on data of the Agency on Statistics of RK (unpublished data)

The Caspian region follows the Kazakhstan's pattern although on a magnified mortality level. Mangystau oblast experienced lower life expectancy than Atyrau region throughout the whole period. The Kazakhstan's average lies in between Mangystau and Atyrau oblasts and this is due to population size domination in the second one. The strong hierarchical nature of mortality is evident, with the Caspian region on the highest mortality level and Kazakhstan performing slightly better. This is seen throughout the study period, although the gap in life expectancy between the Caspian region and Kazakhstan generally very much lessened over time. By the end of the analyzed period, the differences in the average length of life in the Caspian region and Kazakhstan account for around one year in men and less than half a year in women.

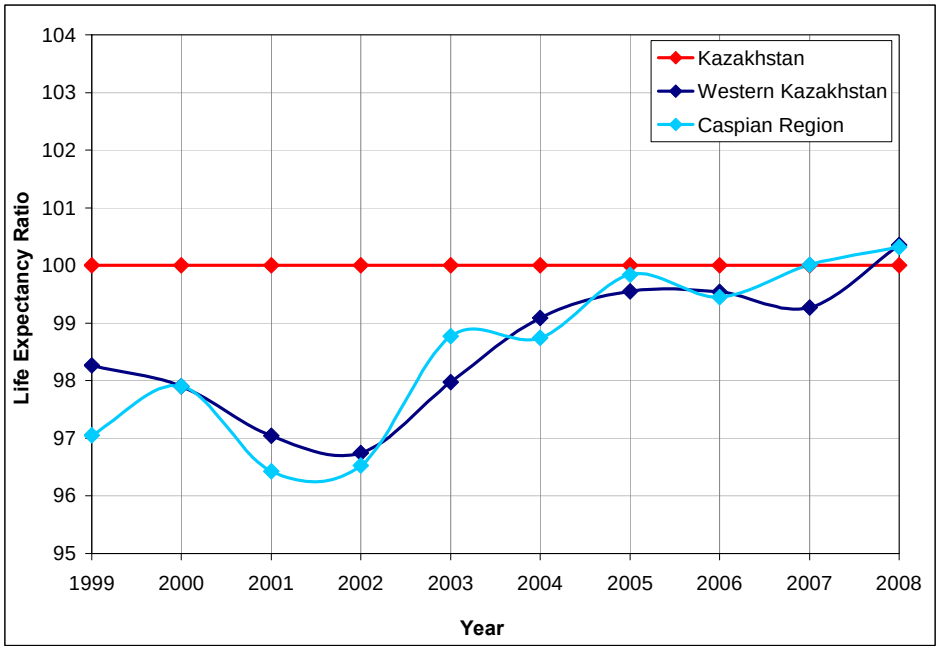
In the case of the Caspian region, we can see slightly improved situation as among males and as among females. So, as we know, life expectancy is a summary measure of the mortality rates experienced at all ages. As life expectancy is a positive measure of survival, if mortality rates decrease over the time then life expectancy will increase. By this depiction, we can notice the gap in life expectancy at birth between males and females in Kazakhstan thus presented by 11 years.

When taking a closer look at the trend of life expectancy within Kazakhstan there are two remarkable issues. Despite the fact that there were some fluctuations in life expectancy for separate

years for the Western Kazakhstan region, we can observe a substantial nearing to the Kazakhstan's average level for the period since 1999. Referring to the second point, after a period of increasing life expectancy, Western Kazakhstan including Caspian region experienced a drop in men's life expectancy for 2001-2003. In Mangystau region this decline is stronger than in Atyrau region and more distinct in men than women. In men, it accounts for almost two years in length of life in the Caspian region.

Figures 7 and 8 show how the Caspian region is approaching the Kazakhstan's average. Life expectancy of Kazakhstan was taken as a standard and life expectancy for the years 1999–2008 from Western Kazakhstan and the Caspian region were compared to it.

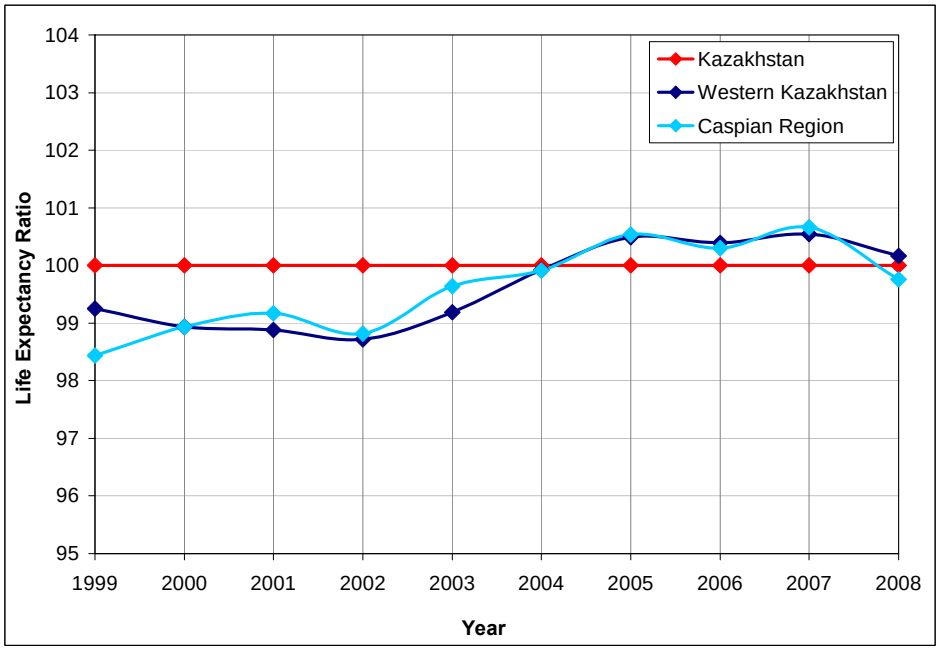
Figure 7 – Life expectancy in the Caspian region and Western Kazakhstan for 1999–2008 compared to life expectancy in the Republic of Kazakhstan, males



Source: Own calculations based on data of the Agency on Statistics of RK (unpublished data)

Men in the Caspian region take a particular position as they have constantly lower values before the year of 2003. As for the point that the Caspian region approaches the Kazakhstan's level – this fact is the most important in females when regarding the absolute values. Around the year 2007, the difference between the Caspian region with the lowest life expectancy and Kazakhstan with the highest life expectancy of the considered regions, the difference diminished to even less than a year in women and around one year difference in men, whereas it was more than five years in 1990s for both sexes.

Figure 8 – Life expectancy in the Caspian region and Western Kazakhstan for 1999–2008 compared to life expectancy in the Republic of Kazakhstan, females



Source: Own calculations based on data of the Agency on Statistics of RK (unpublished data)

Female life expectancy diverged till 2003 and then it is approaching the Kazakhstan's average and sometimes is a little bit higher. It is mainly due to the number of newborns that traditionally high in the given region. It has its own positive and negative sides. For example, high birthrate in this region is collateral to high maternal and infant mortality (see also appendix 1, Figure 5).

Nevertheless, men in the Caspian region experience the fastest growth rate in the time. Women in the Caspian region in comparison with the other Kazakhstan women also realized faster life expectancy growth rates than the average. In conclusion, the Caspian region has gained more in life expectancy since 1999 than in the early 1990s, and now assimilates to the Kazakhstan's average.

4.2 Age-specific mortality patterns

Age-specific probabilities of dying by 5-year age groups in Table 5 give a preliminary clue to the trend in age-specific mortality of the region while also displaying the mortality levels. A substantial decline in infant mortality took place within the observed period, except 2007 and 2008. However, the change in definition of what constitutes a live birth impedes an exact comparison. In 2007, Kazakhstan has adopted the criteria of live births and stillbirths, recommended by the World Health Organization. Today all regions of Kazakhstan passed to the registration of newborn children weighing 500 grams with duration of prenatal development from 22 to 28 weeks.

Further mortality reduction take place in almost all age groups but mostly in adult ages. Women experienced a decline beginning at age 20-24; the decline in men was also strong from the ages

20-24. For the age group under 5 years a reduction happened in comparison with 2000-2002, but at the same time there was observed an increase of probability of dying for both sexes between 2003-2005 and 2006–2008. (see Table 5).

Table 5 – Age-specific probabilities of dying per 1 000 in the Caspian region in 1999-2008

Age	Men				Women				Index 2008/1999		Index Men/Women	
	1999	2002	2005	2008	1999	2002	2005	2008	Men	Women	1999	2008
0	30.0	22.7	17.3	24.1	22.0	16.0	11.3	18.0	80	82	136	134
1-4	8.4	7.9	6.0	4.3	6.6	5.0	5.7	3.9	51	60	128	111
5-9	4.2	3.1	4.6	3.0	2.8	2.1	2.1	1.7	72	63	153	175
10-14	3.8	3.9	3.5	1.8	1.8	1.3	2.2	2.7	46	149	214	65
15-19	9.2	6.2	8.6	6.7	6.0	3.1	3.7	3.8	73	64	154	176
20-24	18.4	20.9	19.2	12.5	5.6	8.1	5.8	5.3	68	94	327	236
25-29	26.8	27.1	24.3	18.4	9.0	10.1	7.0	7.9	69	88	299	232
30-34	28.6	34.0	35.9	29.3	11.4	11.2	8.5	7.5	102	66	251	389
35-39	39.9	40.3	38.2	37.2	13.5	12.4	13.6	9.6	93	71	295	387
40-44	51.9	61.9	53.3	42.9	16.4	17.8	16.2	13.6	83	83	316	316
45-49	70.8	84.3	72.1	61.0	24.0	24.3	22.5	19.7	86	82	295	310
50-54	105.7	113.6	91.1	68.4	37.0	39.6	35.6	31.0	65	84	286	221
55-59	143.4	158.7	126.9	112.5	61.7	58.9	49.2	47.4	78	77	233	238
60-64	223.4	218.6	196.4	159.4	85.0	96.3	80.8	69.0	71	81	263	231
65-69	267.9	256.0	260.3	258.6	139.2	124.8	119.6	115.6	97	83	192	224
70-74	337.1	372.4	355.4	321.3	219.6	212.7	197.5	181.9	95	83	154	177
75-79	492.3	452.5	461.8	478.5	339.7	316.0	290.6	299.5	97	88	145	160
80-84	609.1	606.2	566.5	609.5	495.4	499.0	436.2	470.7	100	95	123	129
85+	845.8	806.5	891.7	874.1	674.6	645.3	685.8	669.1	103	99	125	131

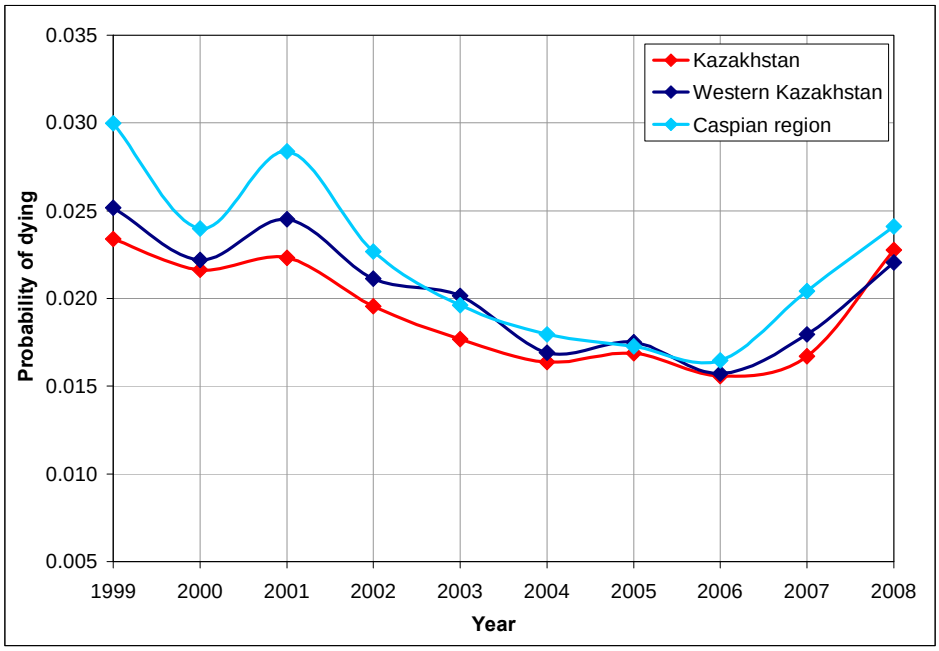
Source: Own calculations based on data of the Agency of Statistics of the RK (unpublished data)

The infant mortality rate (IMR) is widely regarded as a sensitive measure of the quality of life experienced by the populations. This indicator is often used in combination with other indicators, for example, in cross-national comparisons of levels of well-being.

Age- and sex-specific probabilities of dying in the Caspian region with reference base the Western Kazakhstan and Kazakhstan are shown in the mortality surface of Figure 9 and 10.

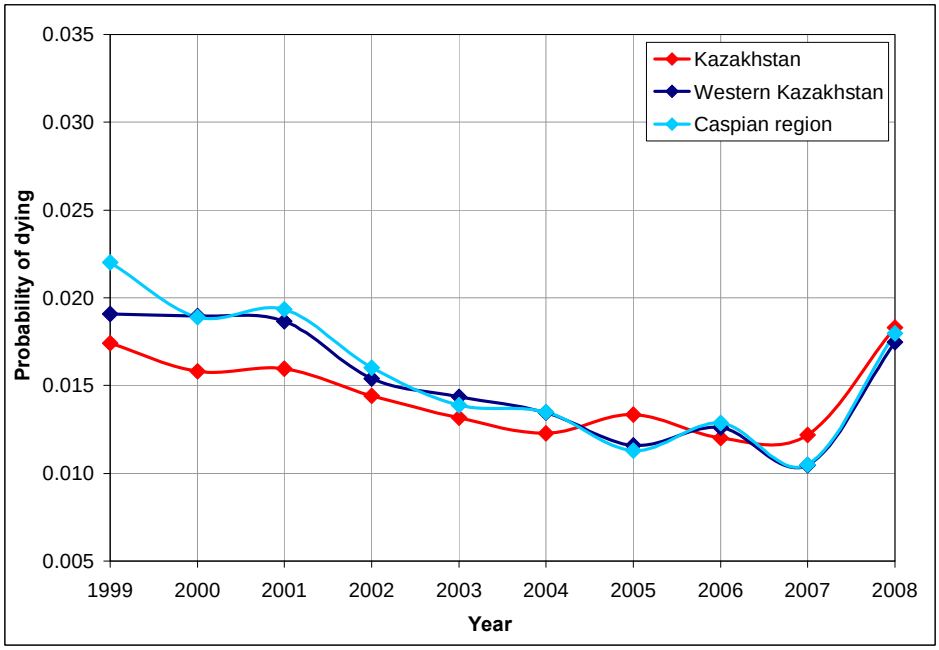
An estimate of the overall IMR (i.e. probability of dying within the first year of life) is shown the significant lag between the European and CIS countries. While we all eventually die, the probability of dying during a given time period is linked to many factors, such as age, sex, race, occupation, and man's social position. The incidence of death can reveal much about a population's standard of living and the conditions of health care.

Figure 9 – Infant Mortality Rate, males



Source: Own calculations based on data of the Agency of Statistics of the RK (unpublished data)

Figure 10 – Infant Mortality Rate, females



Source: Own calculations based on data of the Agency of Statistics of the RK (unpublished data)

The rise in mortality coincided with deterioration of the environment and ecological patterns as in the given regions and in Kazakhstan as whole. It documents both extraordinary rise in mortality that accompanied economic deterioration and as well as the far more tentative recovery of region's economic system. Rise in mortality in last years partly is due to the adoption by Kazakhstan in 2007

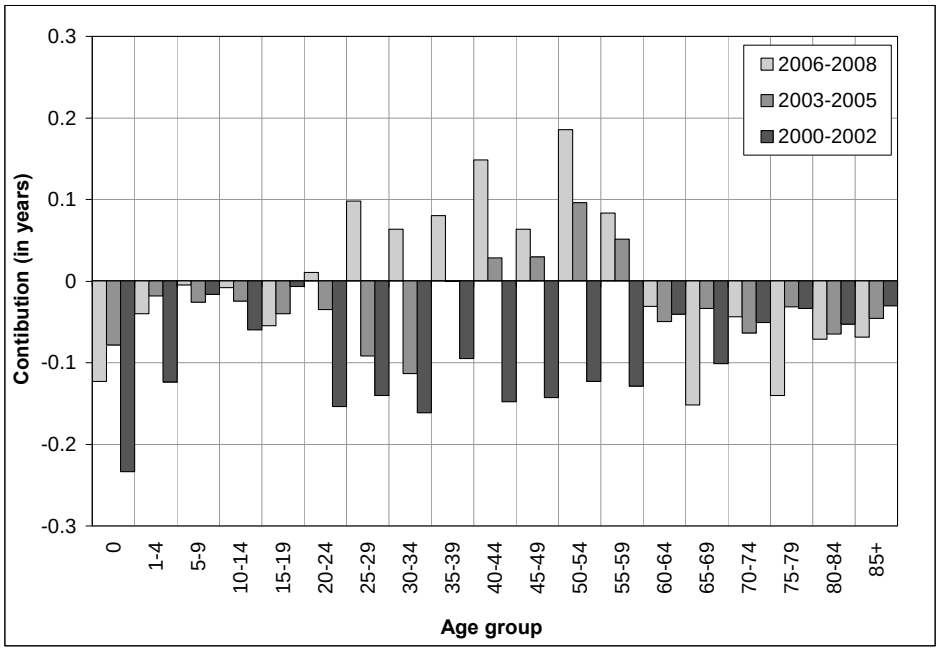
the new rules about the newborn's weight. Today, the child with body weighted more than 500 g is considered to be alive. Before the adoption of this rule, proposed by the WHO, children with body weighted less than 1000 g was registered as miscarriages. On the other hand, the non-observance of health and primary hygienic rules by women in fertile ages and inadequate medical care, especially in rural areas resulted in big numbers of perinatal deaths. It is common thing when women with socially-significant illnesses such as tuberculosis decide not to cure but continue pregnancy even in the cases of physicians' refusal.

Among the main causes of death responsible for the increase of infant mortality are the certain conditions originating in the perinatal period and congenital anomalies (see appendix 1, figures 6-9).

It is well known that the level of life expectancy is a complex interplay of the level of mortality rates and their specific age distribution. Therefore, the impact of certain age groups on life expectancy and the referring differences are now depicted by means of decomposition by age.

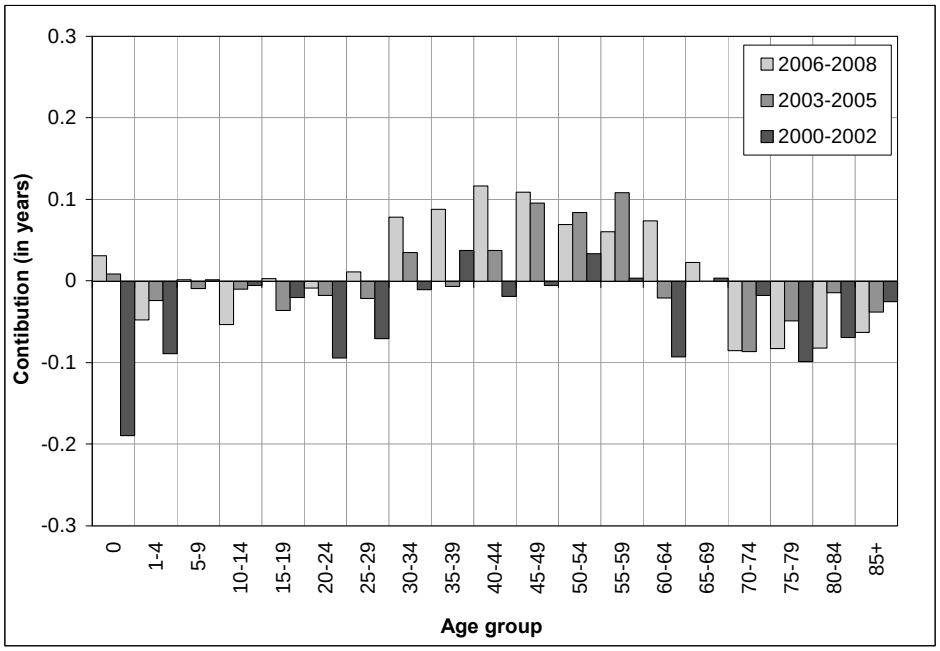
The periods 2000–2002, 2003–2005 and 2006–2008 were analyzed in order to compare points within this small period. The main results are shown in Figure 11 and Figure 12.

Figure 11 – Decomposition of differences in life expectancy between Kazakhstan and the Caspian region by age groups in 2000-2002, 2003-2005 and 2006-2008, males



Source: Own calculations with data from Agency on Statistics of the Republic of Kazakhstan (unpublished data)

Figure 12 – Decomposition of differences in life expectancy between Kazakhstan and the Caspian region by age groups in 2000-2002, 2003-2005 and 2006-2008, females



Source: Own calculations with data from Agency on Statistics of the Republic of Kazakhstan (unpublished data)

This comparison was restricted to the Caspian region by simple summarizing the main demographic indicators and using them in application with Kazakhstan. A positive contribution indicates that Kazakhstan exhibits lower mortality and thus higher life expectancy and hence, if there is a negative value this means that mortality is lower in the Caspian region.

Some key points which go beyond the analysis of ratios before will be mentioned. The general pattern observed before regions the differences in life expectancy between the Caspian region and Kazakhstan from 2000–2002 to 2003–2005 which is then followed by a convergence until 2006–2008. Age groups affected change over time.

Whereas the age group 45–60 amounts for 80% of the difference in the period 2000-2002 in men, the main impact then shifts to the age group 60+ in the end of observation. The total difference in life expectancy in men between the Caspian region and Kazakhstan amounts for 2 years in 2000–2002, and about half of a year for the period from 2002 till now. Women's life expectancy differences constitute approximately 1 year in 2000–2002, then about half of a year in the further time. Also in women, a shift that places more importance towards lower age groups is evident. In 2000–2008 the middle age groups are the most important age groups accounting for around 65% of the life expectancy difference. For both sexes, the adult ages – 30-44 – experienced a gain in importance from 2000-2002 to 2006-2008 and then remained on a comparable level.

A relative mortality worsening in the Caspian region compared to Kazakhstan took place. Infant mortality is rather low for Kazakhstan in average. This fact is expressed in the positive contributions in 2000–2002 both in men and in women; nevertheless it plays only a minor role.

After the adoption of the European definition of what constituted a live birth, the difference in infant mortality in present times must be traced back to a real mortality difference rather than to a difference in definition. As for the differing definition of live birth, this results into incomparableness of infant mortality in early 1990s.

In short, mortality reductions in the Caspian region took place in not every age group during the observed period. It's remarkable, that in the case of the last two periods the main age contributors are age groups above 30-34. High age groups account for most of the life expectancy differential between the Caspian region and Kazakhstan in women, in men these are the low high ages around age 50.

Chapter 5

Mortality by causes of death in the Caspian region

5.1 Overview on cause-specific mortality

Regional mortality differences between the Caspian region and Kazakhstan have been pointed out in chapter 4. The in-depth analysis of causes of death for the Caspian region shall give further insights into the reasons of the differential.

Table 6 – Mortality structure according to main groups of death causes in the Caspian region

Death causes	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
	Number of deaths									
Neoplasms	775	755	756	756	718	753	728	817	772	756
Circulatory	2505	2463	2479	2641	2960	2685	2768	2840	2325	2367
Infectious	372	348	364	338	280	273	277	242	249	221
Respiratory	442	422	373	350	350	214	193	232	543	298
Digestive	297	314	331	374	364	371	374	328	341	311
External	912	1027	1050	990	934	960	1003	894	1043	801
Other	1099	1008	1157	1293	1066	1321	1334	1607	1621	2129
Total	**6402**	**6337**	**6510**	**6742**	**6672**	**6577**	**6677**	**6960**	**6894**	**6883**
	Share (%)									
Neoplasms	12.1	11.9	11.6	11.2	10.8	11.4	10.9	11.7	11.2	11.0
Circulatory	39.1	38.9	38.1	39.2	44.4	40.8	41.5	40.8	33.7	34.4
Infectious	5.8	5.5	5.6	5.0	4.2	4.2	4.1	3.5	3.6	3.2
Respiratory	6.9	6.7	5.7	5.2	5.2	3.3	2.9	3.3	7.9	4.3
Digestive	4.6	5.0	5.1	5.5	5.5	5.6	5.6	4.7	4.9	4.5
External	14.2	16.2	16.1	14.7	14.0	14.6	15.0	12.8	15.1	11.6
Other	17.2	15.9	17.8	19.2	16.0	20.1	20.0	23.1	23.5	30.9
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Source: Own calculations with data from Agency on Statistics of the Republic of Kazakhstan (unpublished data)

Basis of the selection of causes of death was the "European shortlist on causes of death" (European Communities, 2002). The selection list is shown in the appendices as Table 2. All causes of death described in this chapter can be allocated to this table and ICD codes can be looked up. An overview of standardized death rates (SDR) is provided in Table 6 (in the appendix 2). This table gives an overview of the composition of the groups of causes of death by 95 % confidence intervals.

The age distribution of causes of death points out that some causes prevail in young and others in old ages. External causes, for example, prevail in young adults. Alcohol-related causes of death have their major impact in middle adult ages. Cancer, cardiovascular (CVD) and respiratory diseases prevail in all adult ages.

Table 7 – Death causes contribution to life expectancy at birth differences between men and women according to age groups in the Caspian region

Death causes	1999						2008					
	0-29	**30-44**	**45-59**	**60+**	**Total**	**%**	**0-29**	**30-44**	**45-59**	**60+**	**Total**	**%**
Neoplasms	0.02	0.01	0.35	0.68	1.06	9.78	0.02	0.01	0.10	0.55	0.68	6.57
Circulatory	0.13	0.54	1.43	1.72	3.82	35.30	0.16	0.69	1.35	2.20	4.41	42.58
Infectious	0.20	0.29	0.28	0.07	0.84	7.79	0.03	0.20	0.14	0.03	0.41	3.96
Respiratory	0.08	0.03	0.19	0.31	0.61	5.60	0.02	0.07	0.08	0.15	0.32	3.09
Digestive	0.05	0.10	0.11	0.20	0.46	4.27	0.04	0.22	0.21	0.16	0.63	6.06
External	1.17	1.12	0.53	0.10	2.92	26.95	0.82	0.97	0.33	0.13	2.25	21.75
Other	0.58	0.17	0.23	0.14	1.12	10.32	0.33	0.33	0.41	0.59	1.65	15.99
Total	**2.23**	**2.22**	**3.13**	**3.21**	**10.82**	**100.0**	**1.43**	**2.47**	**2.60**	**3.82**	**10.35**	**100.0**

Source: Own calculations with data from Agency on Statistics of the Republic of Kazakhstan (unpublished data)

Circulatory diseases, neoplasms, respiratory diseases are the most common causes of death according to their prevalence in the Caspian region and Kazakhstan. In order to be honest, the respiratory diseases have the main responsibility for the population's morbidity. The infectious diseases, first of all tuberculosis are among offensive causes of death in the region. This situation mainly is a characteristic to the Mangystau region, because of its socio-economic and geo-morphological conditions. Another interesting fact is that in Aktau city is located the republican hospital for prisoners infected by tuberculosis. Males in the Caspian region are an exception within Kazakhstan because external causes of death have a bigger share, as well as digestive diseases; for women in the Caspian region in the period after 1991 external causes also had a bigger share than respiratory diseases, but this has reversed again in the late 1990s.

5.2 Major groups of causes of death

However, comprehensive and concurrent analyses of these trends and their effects on total mortality are not fully elaborated. Moreover, the extent of the trends for one disease which related to those for another is not clearly understandable. The depictions of the recent trends due to the selected causes of death give us the picture of the mortality patterns in the population.

The age-standardized death rates (SDR) for the three main groups: circulatory, neoplasms and infectious and parasitic diseases, including tuberculosis are shown in the Table 8 and Figures 15–20 for the period 1999-2008 together with SDR of all causes (see Figure 13 and Figure 14) for both gender. The European Population Standard of age structure is in use (European Communities, 2002). The impact of the change to ICD 10 is not clearly identifiable from the trend in SDR.

Table 8 – Standardized death rates per 1 000 inhabitants according to gender

Death causes	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Index 2008/1999
	Men										
Neoplasms	289.5	282.0	266.0	251.9	240.3	248.3	247.5	249.4	241.1	225.3	78
Circulatory	1069.0	996.0	1028.6	1029.8	1154.4	1001.9	1032.3	1048.0	837.9	794.7	74
Infectious	87.3	82.1	96.6	79.3	66.6	61.1	60.6	52.5	50.2	43.4	50
Respiratory	150.3	157.6	116.3	83.6	119.5	70.5	66.2	68.8	205.8	81.0	54
Digestive	103.2	101.8	117.1	124.7	122.3	113.4	100.9	94.6	96.4	83.5	81
External	217.4	266.8	272.1	234.9	227.9	218.6	219.8	192.4	209.5	151.3	70
Other	353.3	341.4	374.9	475.1	365.5	435.9	426.6	517.9	532.8	611.9	173
Total	2270.0	2227.7	2271.8	2279.4	2296.5	2149.7	2153.9	2223.6	2173.6	1991.0	88
	Women										
Neoplasms	145.5	144.1	153.8	141.8	135.5	140.9	125.7	141.2	125.8	127.8	88
Circulatory	560.0	545.9	514.5	503.2	590.3	504.3	502.3	460.0	371.2	340.1	61
Infectious	32.7	31.3	24.9	27.9	23.3	18.3	19.8	15.6	16.4	15.8	48
Respiratory	67.4	60.3	54.8	55.1	52.6	28.3	22.7	30.7	89.6	50.6	75
Digestive	53.3	46.7	44.5	42.9	44.9	43.2	44.5	36.8	32.9	35.2	66
External	63.4	55.1	52.0	60.6	50.0	43.7	47.4	40.8	53.7	41.6	66
Other	274.3	248.4	289.2	317.1	244.3	309.9	323.4	364.4	355.4	445.4	162
Total	1196.7	1131.8	1133.6	1148.6	1141.0	1088.6	1085.7	1089.4	1045.0	1056.4	88
	Index Men/Women										
Neoplasms	199	196	173	178	177	176	197	177	192	176	89
Circulatory	191	182	200	205	196	199	206	228	226	234	122
Infectious	267	263	388	285	286	334	307	337	306	275	103
Respiratory	223	261	212	152	227	249	292	224	230	160	72
Digestive	194	218	263	291	272	263	227	257	293	237	122
External	343	484	523	387	456	501	464	472	390	364	106
Other	129	137	130	150	150	141	132	142	150	137	107
Total	190	197	200	198	201	197	198	204	208	188	99

Source: Own calculations with data from Agency on Statistics of the Republic of Kazakhstan (unpublished data)

Recent information on demographic development stresses the noticeable changes in the pattern of mortality decline in the majority of the developing countries. A sharper slowing of progress

against mortality than would have been expected on the basis of European experience has been reported in many developing countries; and there are signs of increasing diversity among them.

As shown in Figure 13 and Figure 14 the trend in mortality due to all causes of death is slowing down which is collateral to the whole Kazakhstan level. This is more pronounced in the case of men than women's.

The changes are related to a decline in the capacity of health programs due to the problems in the sphere of social and economic progress. This trend is highlighted in European research institutions and laboratories, but it's only the question of future. Now we are observing the national trends related to incidence of death due to morbidity. Morbidity refers to illness, injury, and disabilities in a population. And data about the frequency and distribution of a disease can aid to control its spread, and, even more, lead to the identification of its cause. SDR for both sexes aged 0-85 years were specified for the three most frequent causes of death:

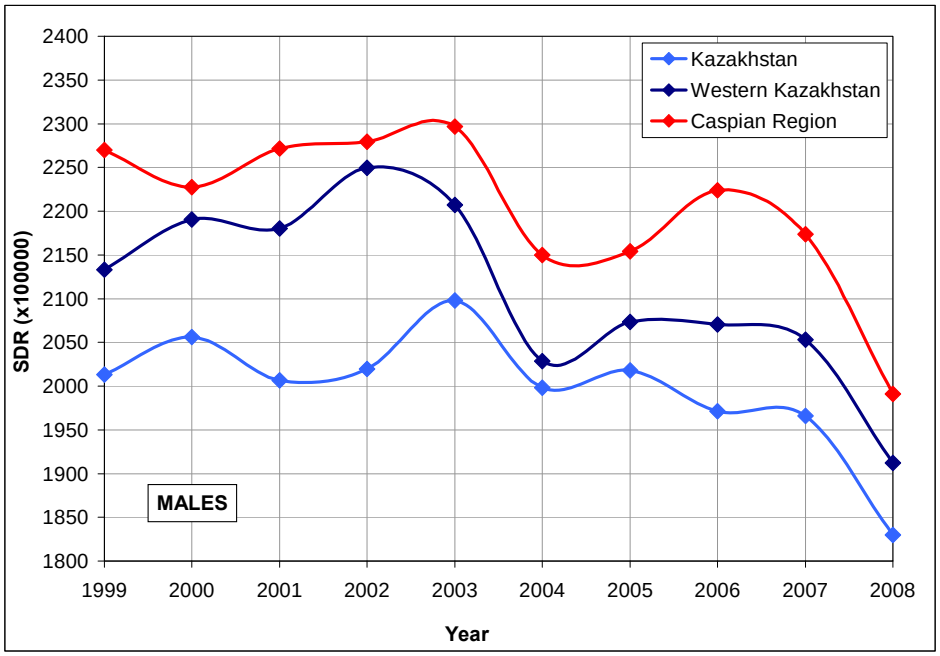
a) circulatory diseases;

b) neoplasms (cancer);

c) parasitic and infectious diseases.

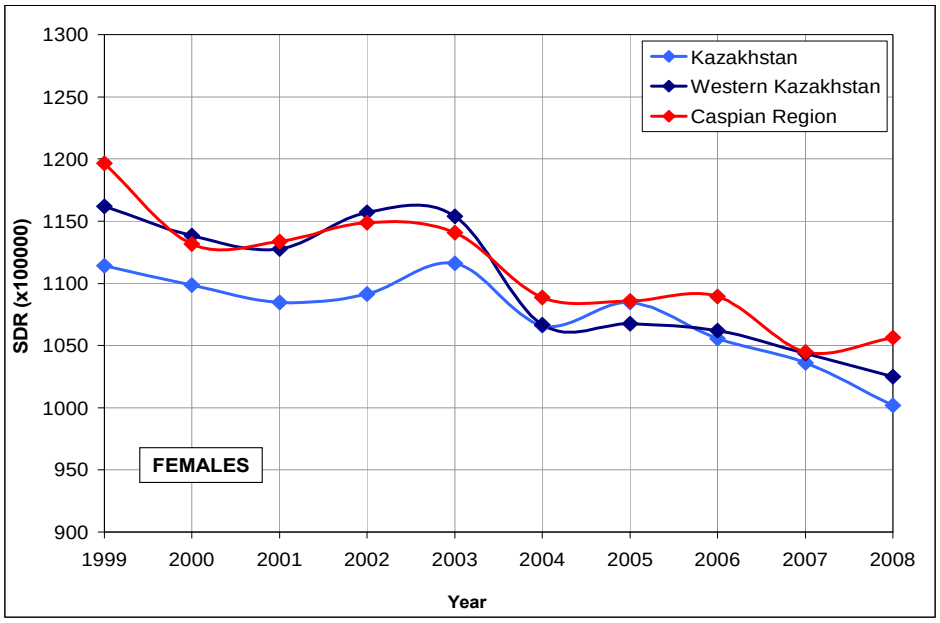
Changes in mortality from heart disease, cancer, and stroke over recent decades in all countries throughout the World have received much attention. SDR for total mortality and mortality from circulatory, cancer, infectious and parasitic diseases, and residual group of diseases were obtained for the years 2000-2008 separated by sex and age.

Figure 13 – Standardized death rates by all causes of death per 100 000 in 1999-2008, males



Source: Own calculations with data from Agency on Statistics of the Republic of Kazakhstan (unpublished data)

Figure 14 – Standardized death rates by all causes of death per 100 000 in 1999-2008, females

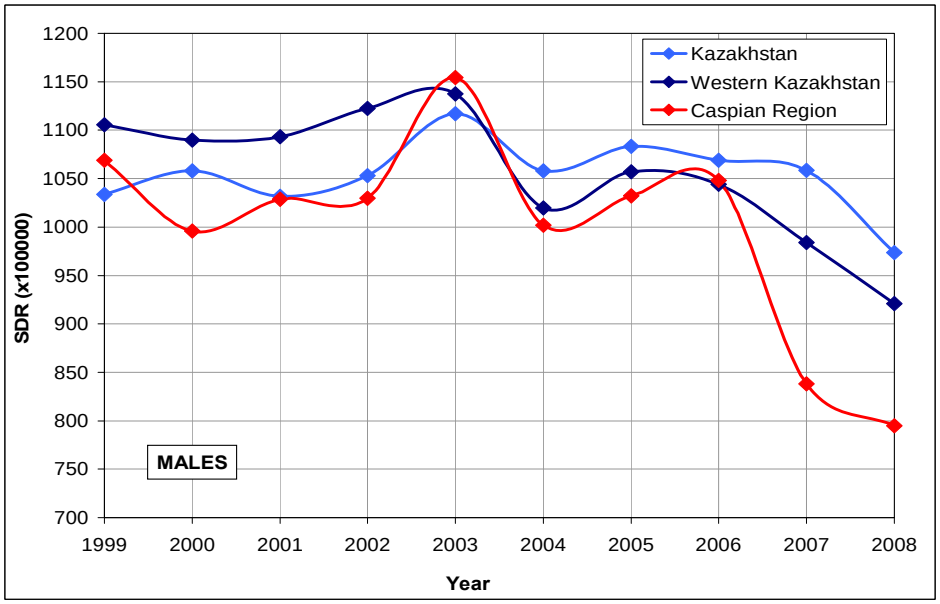


Source: Own calculations with data from Agency on Statistics of the Republic of Kazakhstan (unpublished data)

This contribution is gained by the high mortality rates among men of working ages, which starts to increase from the beginning of 2000s. While the epidemic increase in heart disease mortality in more developed countries ended in the 1970s, in the post-Soviet countries cardiovascular diseases and stroke are responsible for the main loses in the populations, especially among men.

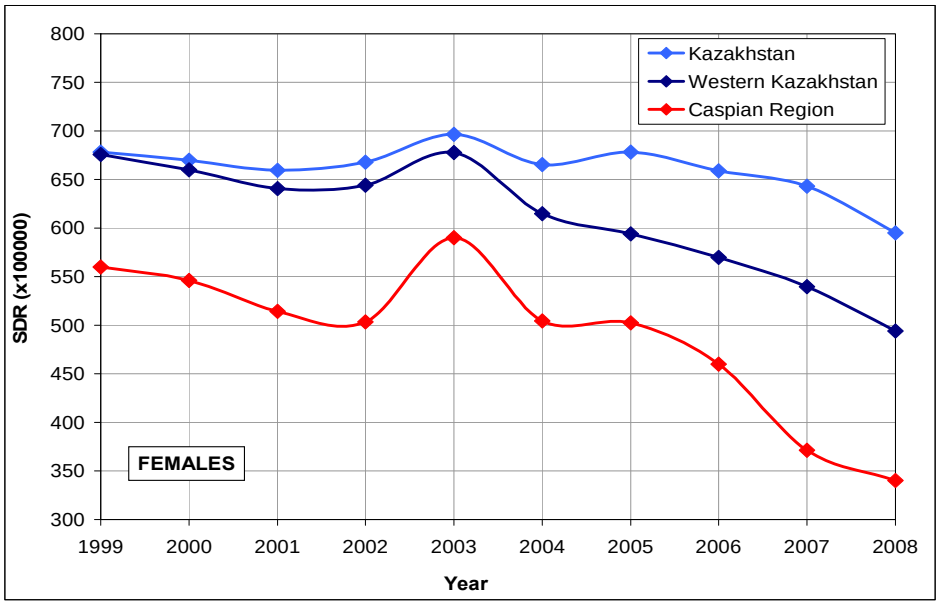
Figures 15 and 16 are the depiction of mortality trends among the selected regions due to diseases of circulatory system. The main representatives of this group are cardiovascular diseases (CVD) and stroke.

Figure 15 – Standardized death rates by diseases of circulatory system per 100 000 in 1999-2008, males



Source: Own calculations with data from Agency on Statistics of the Republic of Kazakhstan (unpublished data)

Figure 16 – Standardized death rates by diseases of circulatory system per 100 000 in 1999-2008, females



Source: Own calculations with data from Agency on Statistics of the Republic of Kazakhstan (unpublished data)

First place among the main causes of death in accordance with the reports of the WHO and the UN is belonged to CVD, they are responsible for the 57% of overall mortality among Kazakhstan population (UNDP, 2008). The comprehensive trend of CVD is its rapid increase during last decade. In Kazakhstan, the deaths from CVD are almost doubled within the last decade.

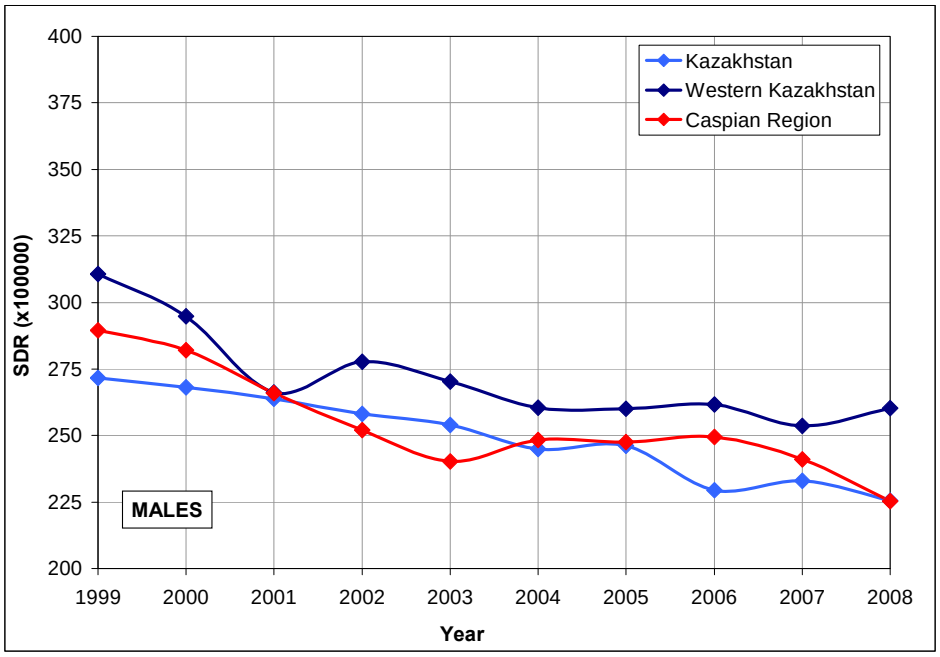
For the Caspian region the situation with mortality due to CVD is much better in comparison with Kazakhstan's reality. This significantly favourable picture much due to the fact that traditionally the main causes of death in the region are accidents, homicides, suicides, malignant neoplasms and respiratory diseases.

By the followed Figures 17 and 18 we can see the growing trend in mortality due to morbidity within Kazakhstan, especially intensive increase is observed in the case of males.

Neoplasms or diseases due to cancer are one of the crucial problems in human health. Almost all researches in the field are focused on lung cancer, lymphoma, breast cancer among women, neoplasms of the brain, multiple myeloma, and melanoma because of increase in their incidence.

In 2000, total cancer mortality for men was 166 per 100000 people in the EU. Overall cancer mortality for women was 95 per 100000, and ranged between 100 and 110 in several Central and Eastern European countries. For example, up to 120 per 100000 people in the Czech Republic and 138 in Hungary. The Czech Republic, as Hungary, had a substantial excess in female mortality for lung cancer. Concerning the incidence of melanoma in the European countries, it increased steeply from the level of 1976 in Northern and Eastern Europe, while the mortality from melanoma increased in Eastern and Southern Europe (UNDP, 2008).

Figure 17 – Standardized death rates by neoplasms per 100 000 in 1999-2008, males



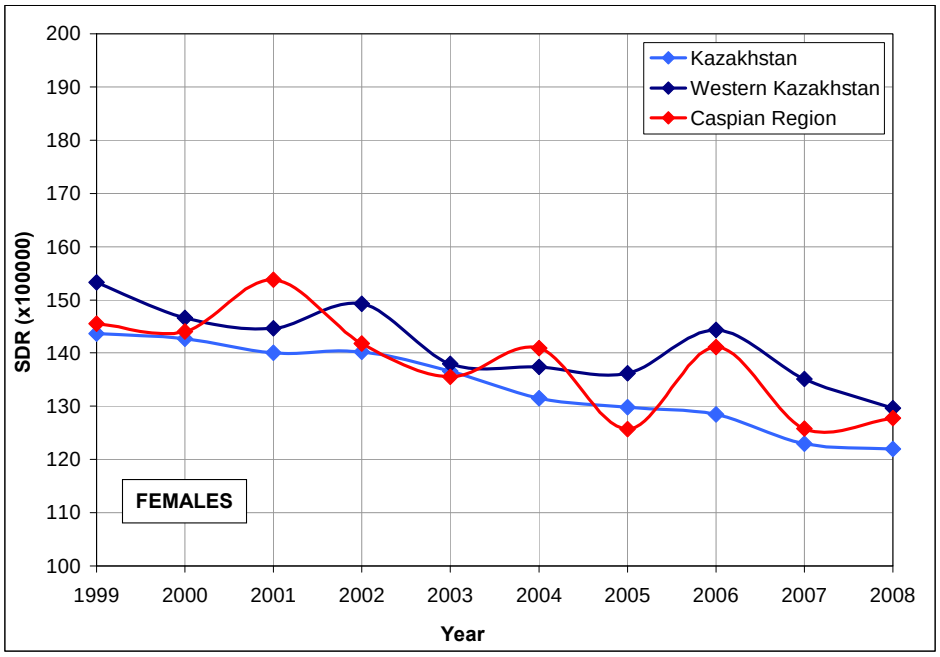
Source: Own calculations with data from Agency on Statistics of the Republic of Kazakhstan (unpublished data)

In the case of Kazakhstan the morbidity of malignant neoplasms in the Republic and its regions is relatively high. First of all it is depend on the geo-morphologic and economic reasons. Western Kazakhstan among the other regions of the republic always is on the first level. The main reason is the oil and gas deposits that lay closer to soil in the coastal zone and the basin of the Caspian Sea. Another factor is laying in the history of the development of the region.

The discovery of vast uranium deposits in the deserts of Western Kazakhstan led to the establishment and rapid development of uranium extraction and processing around Aktau city. Major military sites in Kazakhstan included the nuclear and weapon test sites of Azgir, Kapustin Yar, Taysogan, Ashuluk and Say-Utes, as well as the uranium-mining industry were developed in the region.

The increase of morbidity during the period from 1996 to 2008 more than 1.8 times was revealed in the country. The higher levels of morbidity (from 4.2 to 5.8 cases on 100 000 of population) were revealed in Kyzylorda, Pavlodar, Mangystau, East-Kazakhstan oblasts and in Almaty city. The morbidity of this pathology is higher in males in comparison with females (ratio 1.2:1.0) and these differences are most pronounced in Western Kazakhstan.

Figure 18 – Standardized death rates by neoplasms per 100 000 in 1999-2008, females



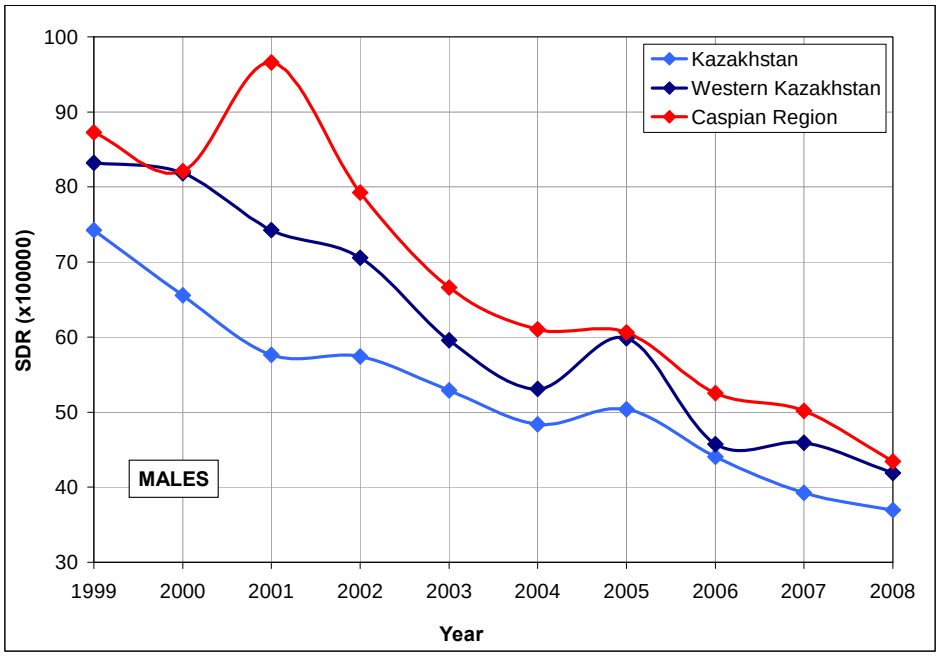
Source: Own calculations with data from Agency on Statistics of the Republic of Kazakhstan (unpublished data)

In accordance with Figures 17 and 18, we can say that mortality rates of neoplasms are significantly lower for Kazakhstan than for its western part including the Caspian region, despite their increase in the last decade. Proportion of deaths due to neoplasms is slightly increasing for the population of Kazakhstan (see appendix 1, Figures 1–4). In the case of the Caspian region this trend of increasing mortality because of cancer mainly is due to the location of the largest military and radioactive waste inheritance of the former Soviet Union in Mangystau oblast.

So, in Aktau city is located the great depository of radioactive waste, Koshkar–Ata, which officially blamed to be the cause of cancer incidence rate in the region. The 50 % of whole population are residents of the Aktau city. That's why the level of mortality from neoplasms in the region is always on the highest positions among the other oblasts.

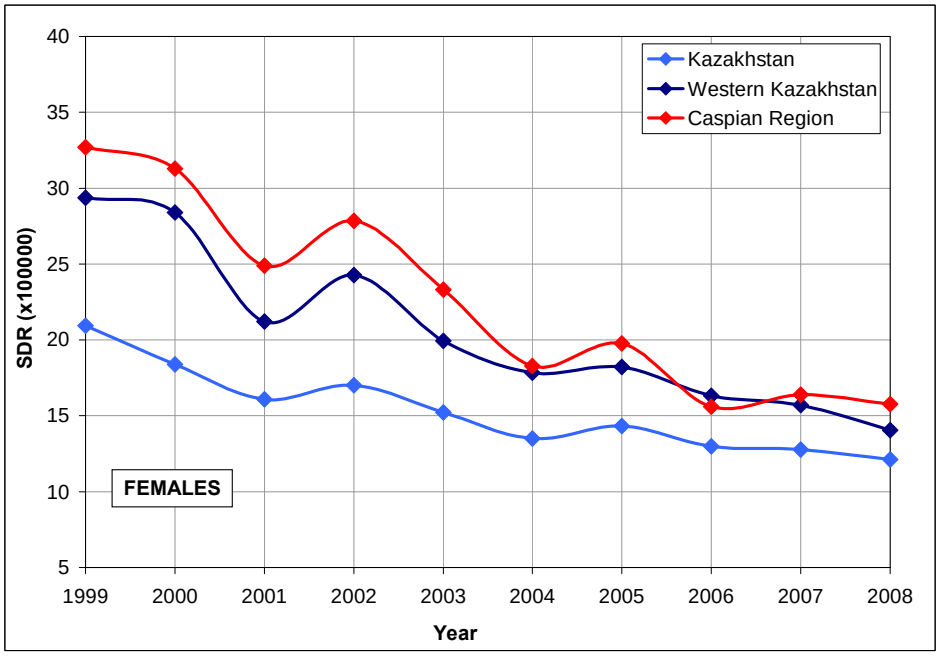
Another acute problem among others in the field of population health and prevention against morbidity is the infectious and parasitic diseases. In spite of the trend towards decline during last decade, the Caspian region has a relevantly bad situation with their incidence. It could be explained through two reasons. Firstly, the incidence of HIV/AIDS is increased and, secondly, the Caspian region composed with the majority of rural districts with predominantly stock-raising and pastoral economy. As it is known, the incidence of the parasitic infections in such rural areas is twice higher in comparison with others.

Figure 19 – Standardized death rates by infectious and parasitic diseases per 100 000 in 1999-2008, males



Source: Own calculations with data from Agency on Statistics of the Republic of Kazakhstan (unpublished data)

Figure 20 – Standardized death rates by infectious and parasitic diseases per 100 000 in 1999-2008, females

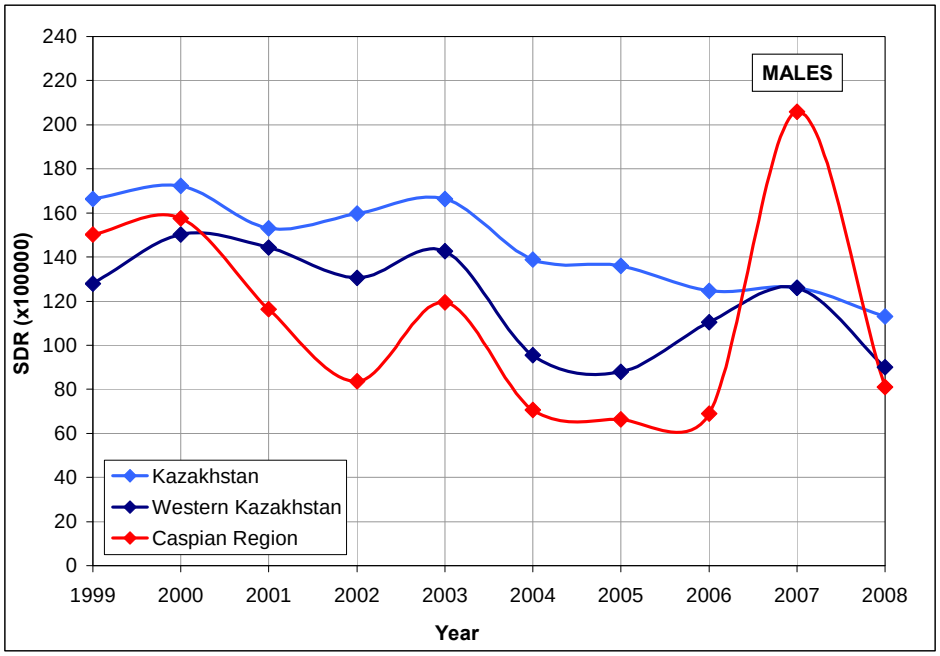


Source: Own calculations with data from Agency on Statistics of the Republic of Kazakhstan (unpublished data)

According to the statistics, 2 million cases of infectious diseases were reported in 2002. What is more alarming, 70% of the affected were children under the age of 15. Last year, about 1,000 HIV-infected people received medical treatment, while more than 500 of the patients had to be hospitalized (Ministry of Health, 2008).

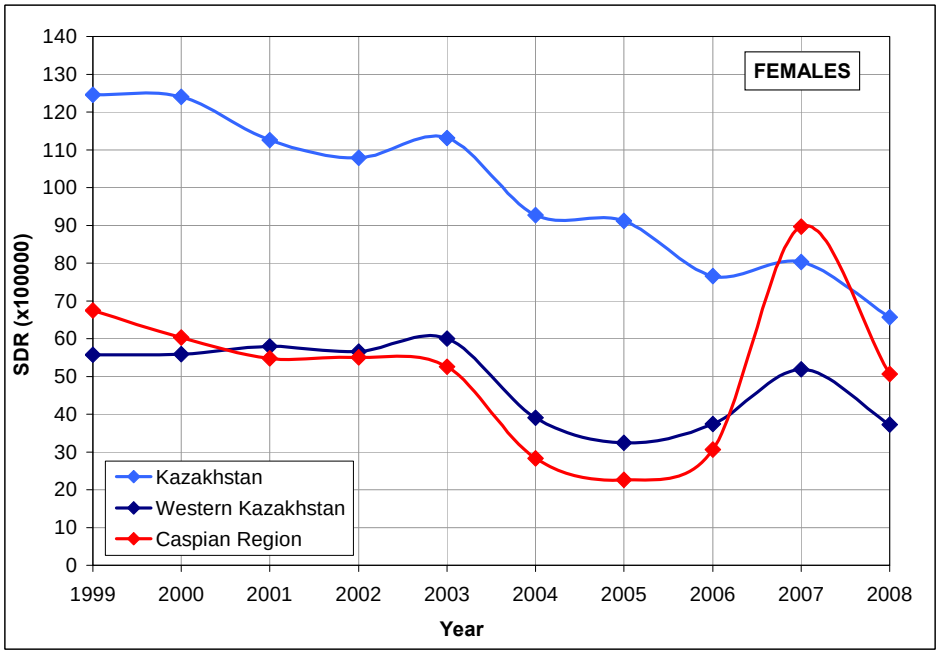
In conformity with our study, we can say that the increase in male mortality rates due to respiratory diseases in Kazakhstan is fueled by the increase in the number of people with tuberculosis among the poorest and marginalized strata of society (see Figure 21 and Figure 22). Every year, 22,000 additional cases of tuberculosis are registered in the country.

Figure 21 – Standardized death rates by diseases of respiratory system per 100 000 in 1999-2008, males



Source: Own calculations with data from Agency on Statistics of the Republic of Kazakhstan (unpublished data)

Figure 22 – Standardized death rates by diseases of respiratory system per 100 000 in 1999-2008, females



Source: Own calculations with data from Agency on Statistics of the Republic of Kazakhstan (unpublished data)

The spread of such diseases as AIDS and tuberculosis are understandably attributed to the low standard of living conditions, poverty and drug abuse. It is officially admitted that almost every one of the overcrowded prisons in Kazakhstan is infected with tuberculosis. The amnesty of 2002 of people serving prison terms for minor crimes added to the problem. The continuing migration of unemployed people from rural areas into the cities also contributes to the spread of the disease. For many of these people, even the cheapest medicines are not affordable. Added to this, the low quality of drinking water in most regions, particularly in Western Kazakhstan, compounds the problem.

Through the last decade the valuable contribution in healthcare system of tuberculosis cure was made by the Ministry of Health of the Republic of Kazakhstan and by the support of international organizations. Conducted measures reduce the incidence of illness. But, unfortunately, the disease lost its "societal" character and becomes common among all strata in society.

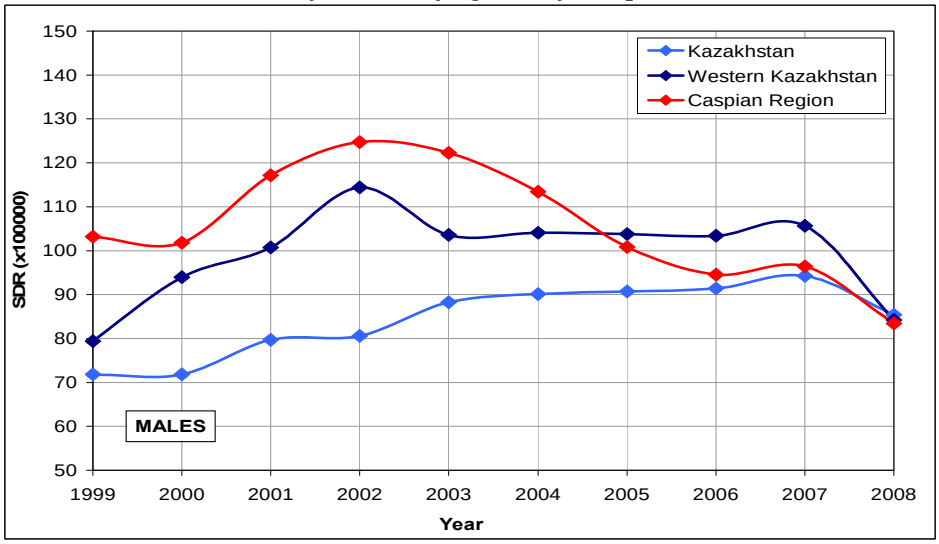
The increase of SDR by respiratory diseases in the last years of the 2000s within the Caspian region could be explained by the flashes of the diseases accused by streptococci (influenza). But the main offensive disease are the tuberculosis, pneumonia, (COPD) and asthma.

The review of medical literature reveals that the incidence of rheumatic fever has been declining for at least 150 years, proceeding by many decades of penicillin use as a main preventive medicine. Simultaneously, the incidence of rheumatic heart disease has been diminished. Scarlet fever becomes diminishing too, with very low mortality. But the diseases accused by streptococci had and will have the powerful influence on morbidity and mortality of the populations, because of their flexibility and ability to adapt. Consequently, these could contribute to the development of the respiratory diseases.

Trends in mortality due to respiratory diseases are relatively low for European countries, representing the continuation of ongoing European decline in diseases of infectious character.

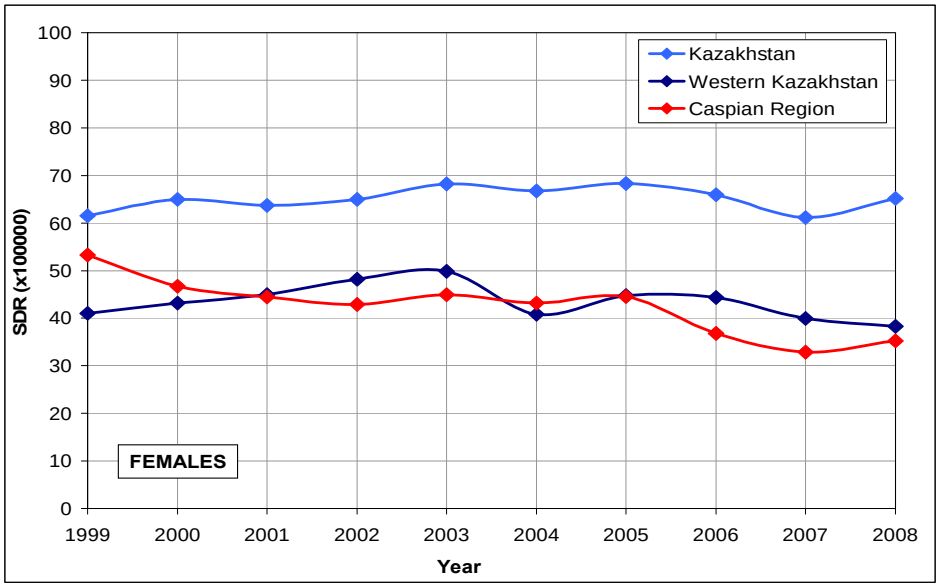
Another group of causes of death includes diseases of digestive system. The depiction of the situation is shown in Figure 23 and Figure 24.

Figure 23 – Standardized death rates by diseases of digestive system per 100 000 in 1999-2008, males



Source: Own calculations with data from Agency on Statistics of the Republic of Kazakhstan (unpublished data)

Figure 24 – Standardized death rates by diseases of digestive system per 100 000 in 1999-2008, females



Source: Own calculations with data from Agency on Statistics of the Republic of Kazakhstan (unpublished data)

Digestive diseases such as chronic liver disease and cirrhosis among other causes of death in the Caspian region are not on the highest positions, but their incidence is much due to the shortage of good-quality water. So, almost all districts within the Caspian region suffer from a shortage of good-quality freshwater. Water scarcity is a major hindrance for local development. Water is delivered by tankers to remote villages, as only sizable urban areas have access to tap water.

Overall in the Caspian Sea provinces of Kazakhstan tap water is available to approximately 70–75% of the population (living mostly in the towns of Atyrau, Aktau and Jana Uzen) (CEP, 2008).

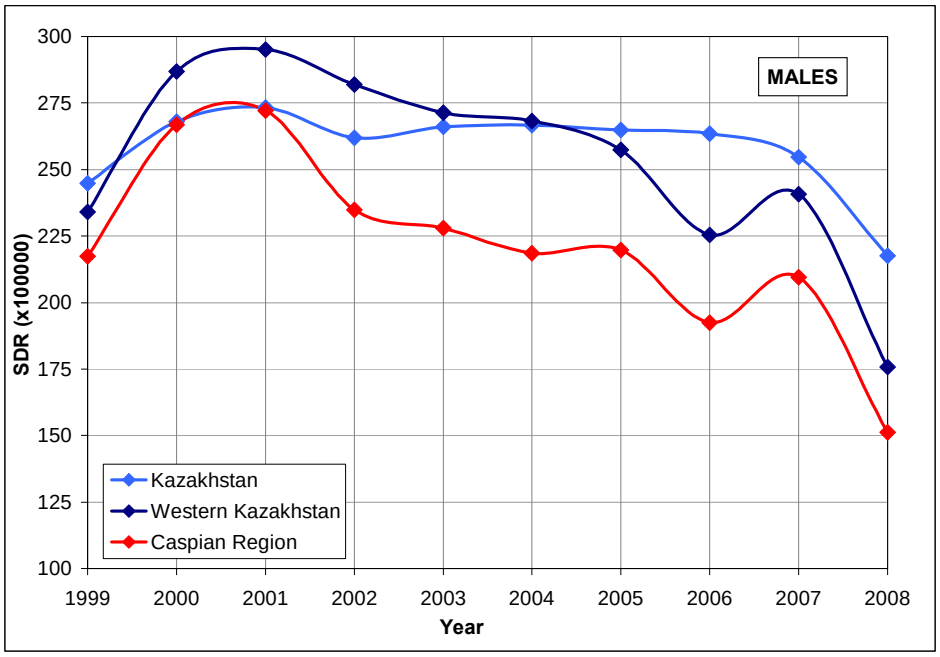
Again the main differences in access are observed between urban and rural areas. In both Caspian provinces domestic use of freshwater (for drinking and household services) amounts to 15 million cubic meters a year. In rural areas – such as Beineu, Mangystau, Tupkaragan, Karakyan districts – water use is lower than 50 liters a day per person, which is below basic health and sanitation requirements.

In following figures by means of standardization we try to show the intensity of mortality due to external causes of death. ‘‘External cause’’ of mortality refers to all deaths not due to disease and natural body deterioration, thereby including accidents, homicides, and suicides.

Recently the valuable share of causes of death in Kazakhstan due to external and alcohol related causes of death as well as those that related to transport accidents (see Figure 29 and Figure 30).

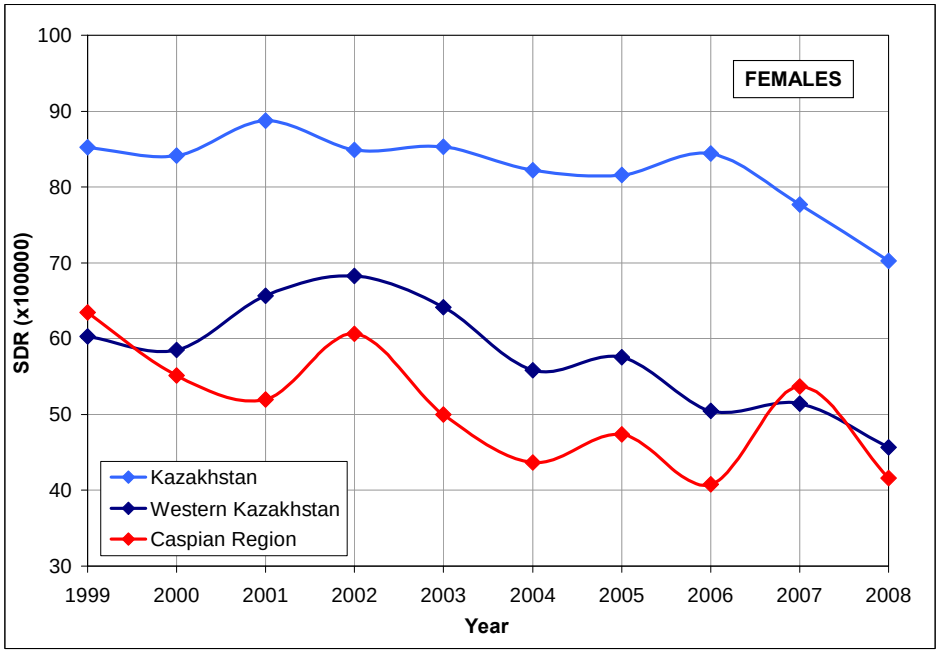
As seen from the depiction, the external deaths in the Caspian region are threefold higher in men than in women. This is collateral to the Kazakhstan’s average.

Figure 25 – Standardized death rates by external causes of death per 100 000 in 1999-2008, males



Source: Own calculations with data from Agency on Statistics of the Republic of Kazakhstan (unpublished data)

Figure 26 – Standardized death rates by external causes of death per 100 000 in 1999-2008, females



Source: Own calculations with data from Agency on Statistics of the Republic of Kazakhstan (unpublished data)

In short, the Caspian region experienced faster declines in circulatory and external mortality than the Kazakhstan average from the beginning of the 2000s until now. Men do not only have higher all-cause mortality, but also higher cause-specific mortality, although the differences

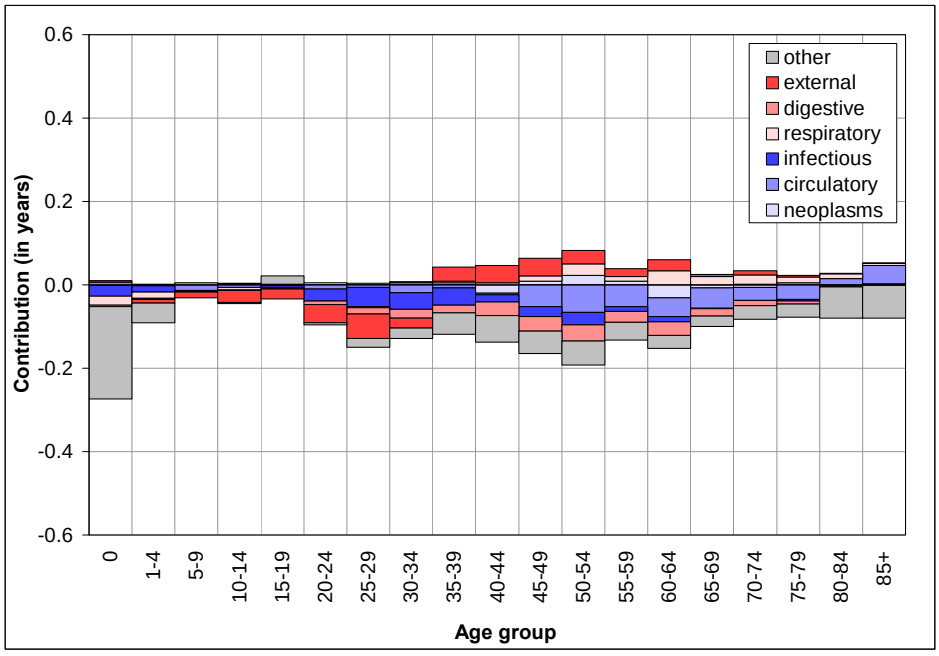
between mentioned regional levels are diminishing. Cancer mortality is seemingly declining in men but stagnating in women within Western Kazakhstan.

In addition, we can say that the presented depiction of the selected causes of death and their characteristic highlights two main things. The Caspian region approaches the Kazakhstan average level due to slowing the mortality by causes of death, in spite of increase in some certain diseases.

With regard to the ICD change from ICD 9 to ICD 10, in circulatory mortality no visual alteration is seen. Studies on the impact of this ICD change point to ambivalent results with slight declines in the US and a slight decrease in the UK. As well, cancer mortality remained rather stable. Respiratory diseases underwent major changes. Due to a change of coding rules, many deaths formerly put to respiratory diseases fall into several other groups in ICD 10, hence an increase took place (Anderson et al., 2001).

After this overview on the cause-of-death specific mortality level, a glance will be thrown at the impact of these causes. What is most interesting is the impact of causes of death on the difference in length of life between the Caspian Region and the Kazakhstan's average. In order to make it more understandable we use the methods of decomposition of differences in life expectancy; the results are shown in Figures 31–34. To find out which causes are associated with the life expectancy increase in the Caspian Region, the life expectancy 1999–2003 and 2004–2008 is furthermore decomposed.

Figure 27 – Decomposition of differences in life expectancy at birth between Kazakhstan and the Caspian region by age and causes of death in 1999–2003, males

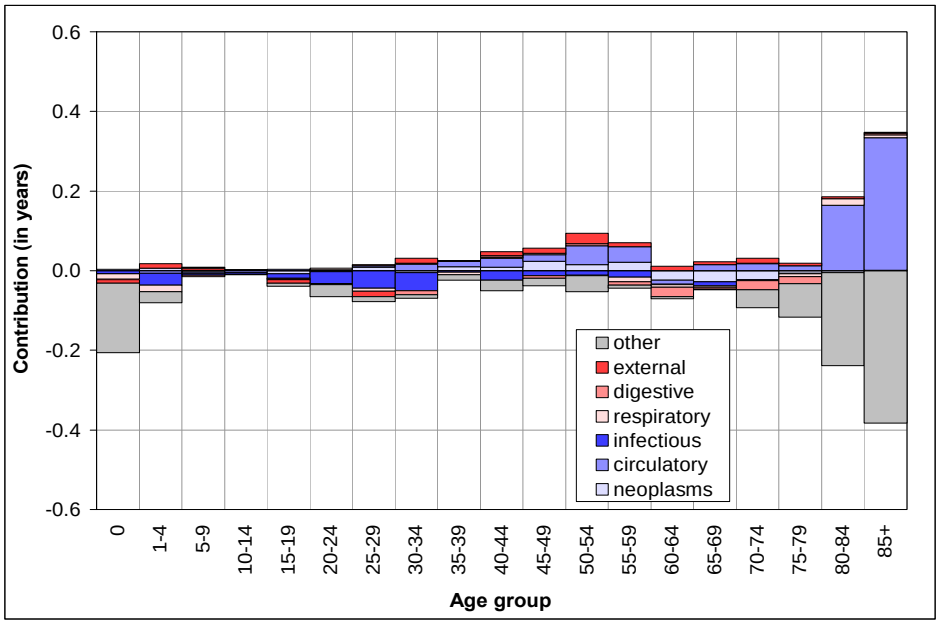


Source: Own calculations with data from Agency on Statistics of the Republic of Kazakhstan (unpublished data)

Circulatory mortality in men constitutes 26% (1.0 of 3.7 years of total difference) in 1999–2003 and 20% (0.5 of 2.6 years) in 2004–2008 of the differences in life expectancy between Kazakhstan and the Caspian region.

In women, the impact is more pronounced: 56% (0.9 of 1.7 years) in the first and 40% (0.5 of 1.1 years) in the second period of 2004–2008 of the life expectancy difference can be allocated to CVD.

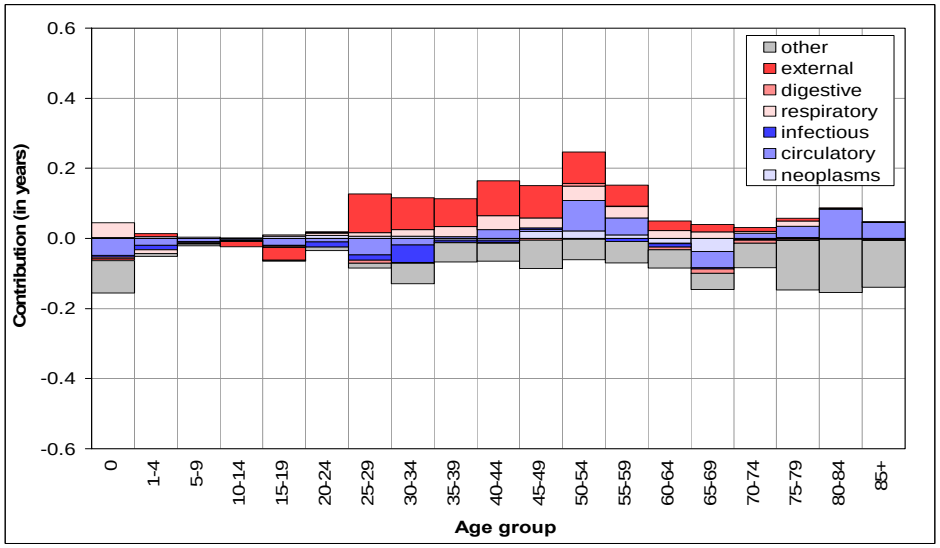
Figure 28 – Decomposition of differences in life expectancy at birth between Kazakhstan and the Caspian region by age and causes of death in 1999–2003, females



Source: Own calculations with data from Agency on Statistics of the Republic of Kazakhstan (unpublished data)

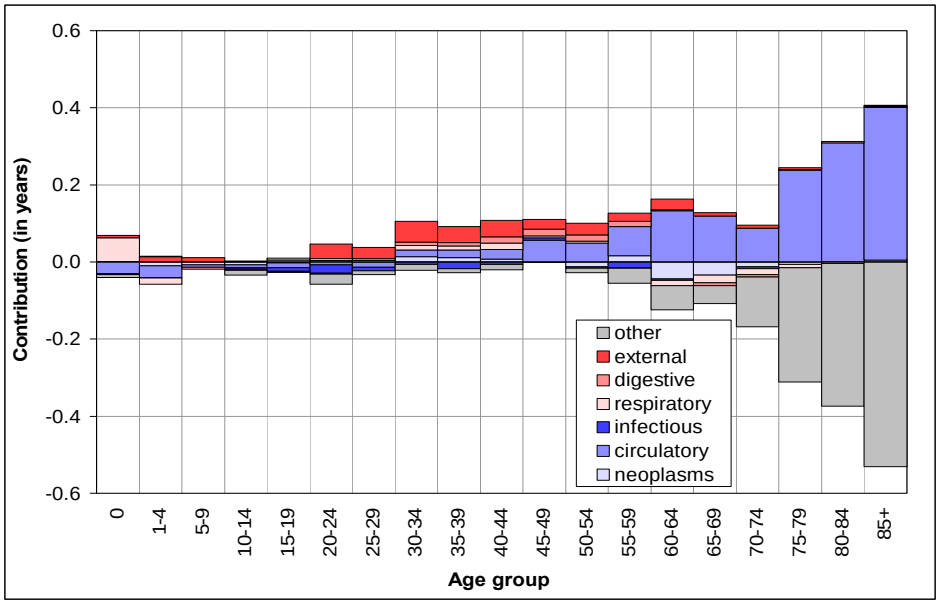
Both in men and in women, the major impact of this class of causes of death is in the very high age groups. While CVD lost importance, cancer gained. In 1999–2003, the life expectancy difference in men was made up to 12% by cancer, while it was 20% in 2004–2008.

Figure 29 – Decomposition of differences in life expectancy at birth between Kazakhstan and the Caspian region by age and causes of death in 2004–2008, males



Source: Own calculations with data from Agency on Statistics of the Republic of Kazakhstan (unpublished data)

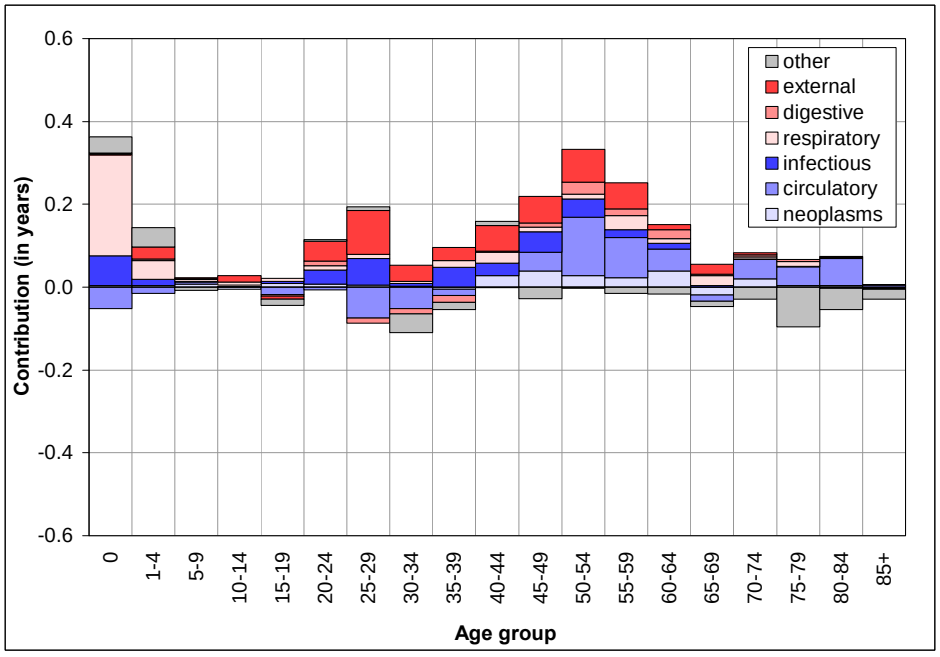
Figure 30 – Decomposition of differences in life expectancy at birth between Kazakhstan and the Caspian region by age and causes of death in 2004–2008, females



Source: Own calculations with data from Agency on Statistics of the Republic of Kazakhstan (unpublished data)

The corresponding figures for women are shown 5% and 11%. Those age groups which are mostly affected are high age groups. Digestive diseases as causes of death have little explanatory power to explain the life expectancy gap between Kazakhstan and the Caspian region.

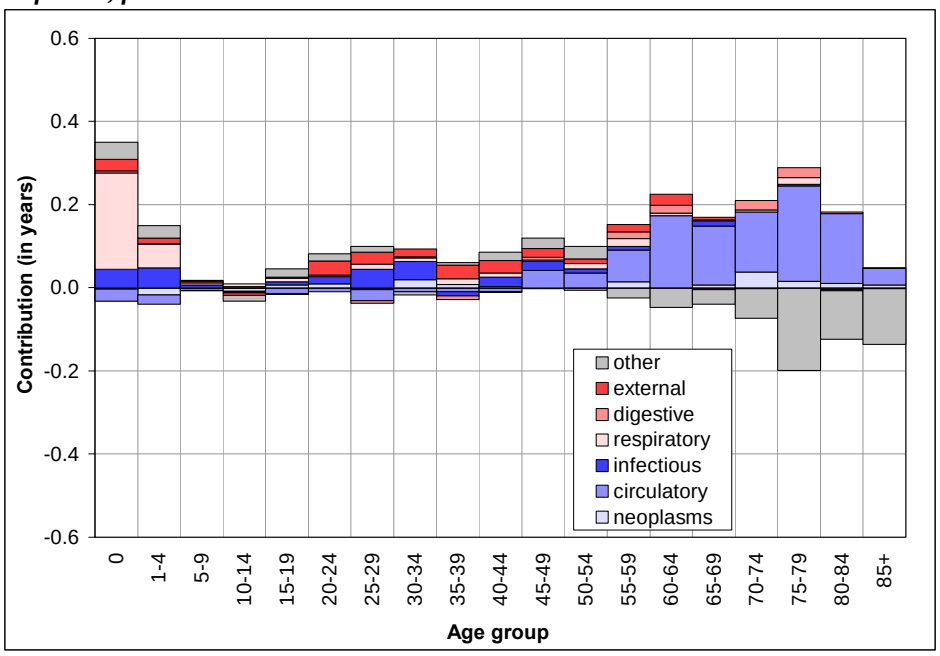
Figure 31 – Change in life expectancy at birth from 1999–2003 to 2004–2008 in the Caspian region by age and causes of death, males



Source: Own calculations with data from Agency on Statistics of the Republic of Kazakhstan (unpublished data)

The life expectancy increase in the Caspian region from 1999–2003 to 2004–2008 is attributable to respiratory and circulatory causes in men. 1.5 years of the male life expectancy increase of 2.5 years can be allocated to these causes. Young and middle adult ages experienced a decrease in external mortality, whereas respiratory diseases decreased between age 30 and 40. Circulatory mortality had the biggest influence (1.2 of 2.5 years) and affected high age groups. This applies also to women, where only circulatory diseases have considerable impact on the life expectancy increase. Improvements in circulatory mortality accounted for 0.6 years of the 1.5 years of life expectancy increase.

Figure 32 – Change in life expectancy at birth from 1999–2003 to 2004–2008 in the Caspian region by age and causes of death, females



Source: Own calculations with data from Agency on Statistics of the Republic of Kazakhstan (unpublished data)

By age, any decline for more developed countries has been apparent only for infants and children under five years old. In the developing countries the situation has been varying much. The contribution of age groups 40-64 for males and 55-64 for females (Azerbaijan, Kazakhstan, Russia) are still non-substantially and unequally to the more developed countries (Sweden, Czech Republic, Germany). By cause of death, decreasing in infectious, respiratory diseases and unintentional injury among more developed countries have been diminished by increasing incidence of CVD and cancer. In the developing countries the epidemiological patterns are still in transition, documented by the high rates of circulatory, respiratory diseases and cancer (Omran, 1971). As a consequence, differential cardiovascular mortality, especially ischemia, among ages above 40 and in older ages remains the major contributor to the increase of gapping in mortality and life expectancy between the countries.

In conclusion, circulatory diseases have more weight to explain life expectancy differences between Kazakhstan and the Caspian region. In comparison with other causes of death circulatory

diseases have less significance for the mortality depiction of the region than for Kazakhstan in total. These effects are more important in women. The impact on life expectancy differences due to cancer is increasing for both sexes at old ages. Respiratory diseases could not be neglected to explain the differences in length of life.

Table 9 – Life expectancy and cause-specific mean ages at death in the Caspian Region and Kazakhstan, 2004-2008

	Males		Females	
	Caspian Region	**Kazakhstan**	**Caspian Region**	**Kazakhstan**
Life expectancy at birth	60.62	60.8	72.2	72.03
Mean age at death by cause				
Diseases of the circulatory system	59.45	63.73	67.55	71.29
Neoplasms	60.98	62.31	59.94	62.3
Infectious and parasitic diseases	38.02	40.87	34.38	37.55
Diseases of the respiratory system	49.97	55.32	55.27	56.79
Diseases of the digestive system	49.85	52.24	55.73	57.69
External causes of death	34.12	38.45	35.41	40.72

Source: Own calculations with data from Agency on Statistics of the Republic of Kazakhstan (unpublished data)

To complete the picture, the cause-of-death specific mean age at death is given in Table 9.The covered period is 2004-2008. Cause-specific mean age at death is higher than overall life expectancy in cancer. People dying due to circulatory diseases experience a longer life than the average. The mean age at death in respiratory diseases in men is lower than the average life expectancy; as it is lower in women. Other listed cause-specific mean ages at death are treated beneath.

Chapter 6

Outlining regional patterns and major findings

6.1 General mortality structure of the Caspian region

After a divergence in life expectancy of the Caspian region and Western Kazakhstan from the Kazakhstan average, a convergence set in after 1999. This convergence was the result of a mortality decline. Though the Caspian region is still on the bottom, it experienced the fastest rise in life expectancy compared to Kazakhstan. The hypothesis of a mortality approach from the Caspian region to the Kazakhstan mortality level can be agreed upon. A further specification is that women came very close to the Kazakhstan average; the difference in life expectancy constitutes only one year to date. Men also approached the Kazakhstan average and the gap is two years in life expectancy. Nevertheless, men in the Caspian region exhibit the highest growth since 1999.

Almost all age groups were involved in this development. Before 1999, there was only little progress in reducing mortality but the Caspian region caught up very much during the 2000s. Men in middle adult ages lag behind the trend of fast mortality reductions. Women, on the other hand, underwent a more stable mortality reduction when regarding the trend across age groups. The same was found by Mai (2004) who calculated the gains and differences of East to West German age-specific mortality rates. Nevertheless, the high age groups (with peak around age 70) in women and the middle-old ages (with peak around age 50) in men cause the major part of differences in life expectancy between the Caspian region and Kazakhstan. This is a result of high numbers of deaths in the high age groups.

6.2 Cause-specific mortality structure of the Caspian region

The analysis of cause-of-death-specific mortality revealed those causes, which pushed the mortality increase of the Caspian region. Deaths in cardiovascular and respiratory diseases, for example, underwent a substantial rise. Since this decline was faster than in the Kazakhstan average, this is one reason for converging mortality rates. Even though a mortality decline in the Caspian region was seen before 1999, more improvements took place thereafter. Cancer mortality increased suddenly from 1999-2008 though mortality rates were even lower than the Kazakhstan's average. Dinkel observed this fact as well and concluded that cause-specific mortality data for the Germany is not reliable due to differing coding practices in Kazakhstan and Germany (Dinkel, 2001). In addition, the etiology of cancer does not permit such sudden steep increases. After 1990, cancer mortality is falling again in men and stagnating in women.

Increasing smoking prevalence some decades before among women and resulting lung cancer might be an explanation for this observation. Mortality in CVD explains the difference to Kazakhstan with regard to life expectancy in very high ages; however this group underwent a substantial decrease. Cancer contributes to the explanation in old ages. Respiratory diseases no longer explain mortality differences between the Caspian region and Kazakhstan. The share of this group is lowering and the mortality level almost equals the Kazakhstan average.

Avoidable causes of death show diverse patterns. After a stable trend during the 2000s, the whole group of avoidable causes shows a mortality increase, followed by a decline that took place faster than the average decline in Kazakhstan. The increase is reflected in causes amenable to health policy and in ischemic heart disease, but not in causes amenable to health care and non-avoidable causes. Mortality of causes amenable to health care is very interesting: the common sex-specific pattern observed in other diseases does not exist. This group furthermore experienced a very strong decline throughout the whole observation period. The hypothesis, saying that avoidable mortality will experience a substantial decline in last decades is not correct.

An increase around 1990 shifted avoidable mortality first to a higher overall level. Only a few years later, the Caspian region reached the level that existed before 1999. The decrease can largely be allocated to causes of death amenable to health care. The concept of avoidable mortality was invented as a measure of public health and health care supply. When efficient health care is available, then mortality from amenable causes should decline faster than overall mortality (Simonato et al., 1998). This cannot be agreed upon in the case of the Caspian region. In the Caspian region, there is a considerable decline in non-avoidable causes. Simonato and others (1998) found the greatest decline for causes amenable to treatment and better medical care. These causes are comparable to the group of causes amenable to health care chosen in this study. With regard to this group, the Caspian region does experience a mortality decline faster than overall mortality. During the 1990s, it was even faster than the Kazakhstan average decline. In fact, avoidable mortality turns out to be sensitive against the societal change during last decades.

Critically commented has to be upon the age limit regardless of sex. Ischemic heart diseases are for example a very common cause of death especially among very old women. Since the age limit includes only those deaths up to age 74, IHD mortality is therefore underestimated compared to men. The decline in IHD mortality is possibly the simple result of a postponement of deaths to higher age groups. The same effect potentially amounts for a certain proportion of the mortality decline in the other avoidable causes. The current selection of causes with fixed age limit is considered a compromise between medical state of affairs, data processing, and comparability. Lists with avoidable causes of death must therefore be subject to steady enhancements.

External and alcohol-related causes of death in the Caspian region underwent major changes throughout the whole period from the 1980s until 2002. External causes exhibit a higher level in the Caspian region than in Kazakhstan. The increase in external mortality in men right after 2000s is almost fully explained by traffic accident mortality. The pattern is less clear for women. The hypothesis of excess traffic accident mortality is thus agreed upon, though this fact is more pronounced in men.

The situation in the Caspian region with respect to alcohol-related mortality is less favourable. Whereas mortality was equal to the Kazakhstan average during the 1980s, it reached a peak in the years around 1992 (Baker & Rooney, 2003).

Such contradictory picture of recent trends in mortality patterns are occurred primarily to the fact of differences in political, economic and historical development of these countries. Possible explanations for the observed trends may be considered as following:

a) epidemiological (risk factors);

b) social structure;

c) health care services.

Epidemiological change

In the paper were pointed some diseases such as CVD, stroke, and cancer as the major attributors to the death. These must be tackled to reduce the disparities of the trends in mortality of CEE and CIS countries. Most of these diseases are strongly correlated with some "risk factors" as tobacco, alcohol, cholesterol and high blood pressure. Fro example, the lung cancer and ischemic heart disease trends are consistent with tobacco consumption trends. In the Czech Republic, increase in sales of tobacco and cigarettes through 1960s and 1970s led to the increase of male mortality rates from lung cancer among ages 20-44. For females, the lung cancer mortality rates were 5-10 times lower than that of males. Nevertheless, these indicators were the highest among observed seven Eastern European countries. This study was made on the examination of the patterns of lung cancer mortality rates and cigarette sales in 1960-1989 in CEE with a total population of 97.5 million people and 43 000 deaths from lung cancer in 2000.

Social and economic change during the 2000s

Between the last decades of past century all world faced a new turn of contemporary international history. The breakup of the Soviet Union has given birth to the newest independent countries and acute questions of recent security and stability. International relations and countries'

operations in the world market became the mirrors of the internal changes in social and economic structures. The deterioration began in 1990 and lasted until the middle of 1990s due to the greatest economic, political and social instability, seen in material setback, large declines in per capita income, growth in unemployment and sweeping and these peculiarities are seeing today.

During the last decade economic and social structures improved and it's immediately influence on the main demographic indicators and interrelations between them and economic ones. Health system restructuring is also a feature of this period.

The main consequence of the Soviet Union's collapse is the break of Soviet social paternalism, which had been guaranteed the government's protection to every man such as pension, allowances, benefits, full-paid leaves and so on. The understanding of government's inability to continue such protectionist measures appears in a severe psychological stress, which today is acknowledged as the main offender of a lot of diseases, including cancer and stroke.

Nevertheless, inequalities existing in employment status, education, income, and housing are the main social determinants of population health.

Health care services: access and quality

Access to optimal health care for the low-incomers is a particularly important issue considering the differences in mortality among more- and less developed countries. Health system free of charge was lost during the transformation period in the post-Soviet countries and fee-for-service primary care health system is more accessible to those with high incomes, social "non-targeting" groups.

In summary, there is another important key issue concerning the quality of health care services, which can be responsible for the positive contribution in the deal of health and mortality improvement.

6.3 Summary of the findings

The Caspian region faces many as chances as disadvantages for its future development. Tourism, cheap land and workers are among them. When these opportunities to gain in the economic development will be taken, this could be reflected in higher life expectancy. Disadvantages are polluted environment, specific industrial situation of the region that could complicate the human excess to health and wealth.

Current trends suggest, however, that the Caspian region will not reach the Kazakhstan average level in the medium term. Reason for that is the rural structure of the state with its implications. Economy is weak to date. Nevertheless, the Caspian region experienced a steep economic improvement in absolute terms since 2003. After 1999, subventions came from the Western countries and the US mainly. These subventions will decrease and the new actors of the World market, as China will benefit the regional economy. Another disadvantage of the Caspian region is that rural populations usually face shortages in infrastructure and high emigration to the urban areas, especially among young people. With regard to mortality, the shortages in health care are the

small number of medical specialists and the long distances to hospital, which is notably relevant in the occurrence of myocardial infarctions and traffic accidents. The health care system in Kazakhstan was not bad in the Soviet period, though it lag now behind in medical technology. To date, the public health system faces altered conditions. Medical technology is on low standards all over Kazakhstan.

Health problems that arose at late decades are alcohol-related diseases, stress, external causes of death and the prevention and treatment of circulatory diseases. In the special case of the Caspian region, there is also a lack of country doctors due to retiring physicians and the shortage of young people to replace them.

Circulatory diseases depend on prevention as well as on fast emergency admission to hospital. Since the latter fact is not given in the Caspian region, CVD mortality will probably not fall down to the Kazakhstan average level. The adjustment of the rural infrastructure towards faster emergency admissions to hospital on the countryside is not realistic because rural areas are likely to loose even more population to the centers. Respiratory mortality might remain on the Kazakhstan average level due to low environmental pollution. Cancer mortality should follow the Kazakhstan trend of falling death rates.

This disease group is still far from the Kazakhstan average. Assuming that hospitals in the Caspian region have similar medical equipment as in the rest of Kazakhstan, reasons for differentials must be behavior-based. External mortality will remain high in the Caspian region. Traffic accidents will continue to determine external mortality. Since the fatality of car accidents is almost twofold the Kazakhstan average (Becker, 2005), this leads to the conclusion that traffic accident mortality will remain high unless action is taken. A reduction of alcohol-related mortality is theoretically possible by effective prevention programme. Alcoholism and its relationship to political and societal changes introduced by the open society and transitive market are often subject to discussion. This is also the relationship between alcoholism and unemployment. People are thought to start drinking because they lost their job and want to escape from reality. Because of alcohol problems, they reduce the possibility of getting a new job. Policy guidelines such as education on alcohol abuse are in demand to fight this vicious circle. Strengthened traffic checks with field sobriety test, reducing the legal alcohol limit and reductions of speed limit at dangerous spots can decrease the number of fatal accidents.

Raised taxes on alcohol as in Scandinavian countries could possibly decrease alcohol consumption in the long term. However, in Kazakhstan these kinds of changes can only be done at national level and are not very likely. Avoidable mortality is likely to reduce further since the health care system steadily develops.

However, the group of causes amenable to health policy will remain on a fairly higher level than the Kazakhstan average (for reasons of composition of this group with traffic accident mortality and other causes of death).

With respect to the urban-rural mortality divide, the trend is difficult to assess. As mentioned before, subventions from the Europe and subdivisions of the UN that supported particularly

disadvantaged rural areas will substantially decrease. Will the rural districts use its potentials of tourism, cheap land, workers and great nature, and then the convergence to the cities will probably begin.

Further growing life expectancy in the Caspian region is very likely to be collateral to the Kazakhstan's average. If the Caspian region will equal the Kazakhstan average level depends on its socio-economic development and can only be reached in the long term.

Conclusion

Objective of this study was to give an impression of the standing of the Caspian region within the Kazakhstanian context in respect of life expectancy and cause-specific mortality from the end of 20th century until now. Kazakhstan level as well as regional level was focused on. Inequality and socioeconomic factors were addressed, too.

Cause of death-specific mortality data and population data at Kazakhstanian level covers the years 1980–2006 (ICD 9, ICD 10). The period from 1999–2008 was observed at the Caspian region level, cause-specific analysis was performed for the period from 2000–2004. Demographic and statistical methods such as standardized death rates (SDR), decomposition of life expectancy and other methods were applied. The Caspian region is the winner when regarding the absolute life expectancy gain in years in the observed period. Women underwent a more favorable trend then men in general. Especially favorable trends are observed for respiratory diseases, mortality due to external causes of death, and mortality amenable to health policy. Circulatory diseases made the largest contribution to the life expectancy increase. Remaining excess mortality can be allocated for many causes of death, but some are particularly worth mentioning: female cancer mortality, external and alcohol-related causes, and the group of causes amenable to health care, first of all, those, concerning infant and maternal mortality. Increased mortality in CVD, external and alcohol-related causes explain much of the life expectancy difference between the region and Kazakhstan, as whole. The Caspian region exhibits a strong urban/rural mortality divide with urban population having much higher life expectancy than the rural population.

In general, mortality rates in Kazakhstan are about 17% higher than the European average. Across all age groups, the highest excess mortality is not due to external causes (as in the Russian Federation and some other CIS countries) but to respiratory and infectious diseases. Nevertheless, excess mortality from external causes is high. The single most prominent cause of excess mortality is chronic lower respiratory disease. Although this may be a catchall for other causes of death, a number of unfavorable environmental (use of solid fuels) and behavioral (smoking) factors probably play a major role. Excess mortality from external causes is about 18% over the European average. Homicide rate is particularly high.

However, as in other CIS countries with high mortality from other causes than cancer, the proportion of cancer deaths comprise about 12% of total mortality in Kazakhstan, compared to a 28% in the 1990s since 1999 the rate has been steadily decreasing.

Respiratory diseases accounted for about 6.4% of total mortality in Kazakhstan in 2008. Mortality from digestive diseases has dropped steadily in European countries over the last 20 years but has increased considerably in Kazakhstan, particularly in the Caspian Region. As mentioned, a considerable part of the problem is the excess mortality from chronic liver disease and cirrhosis.

External causes of injury and poisoning include unintentional injuries (transport injury, poisoning, injury due to falls, fires and drowning and other) as well as intentional injuries (self-inflicted injuries, injuries due to violence and war and other). Overall external causes were responsible for 165 deaths per 100 000 population in Kazakhstan in 2003 while the European average was twice lower.

Comparative analyses of variations of mortality by age and sex, and possibly other socioeconomic variables, can provide more specific insights into the country's excess mortality. One should keep in mind that the mortality crisis in the CIS countries peaked around 1994 and 1995 (in the aftermath of the collapse of the Soviet Union) and, therefore, the trends of the period 1999–2008 are generally more favourable than those for the period 1990–2003. And in this case, perinatal mortality remains a serious problem.

Mortality in the Caspian region in the 0–14 age group (196 per 100 000 in 2003) is about 12% higher than Kazakhstan's average. It has improved from the level of 199, similar to improvement of all Kazakhstan's of 3.8%. The improvement is practically comprehensive across all causes of death and by sex.

Mortality in the 15–29 age group (296 per 100 000) is one quarter higher than the average of 201. The excess mortality over the average for this age group is due mainly to external causes and also to infectious diseases.

High CVD mortality is a problem in this age group, although it may be partly due to misclassified alcohol-related deaths. Since 1995 total excess mortality has improved, but progress has not been even across all causes of death and the levels remain higher than in 1990. This is a pattern common to many CIS countries.

In the 30–44 age group, the situation is similar to the above but excess mortality due to external causes and CVD compared to the average pattern is greater. The increasing trend in mortality from digestive diseases is a cause for concern. Mortality in the 45–59 age group is most close to the Kazakhstan's average, and has not improved much since. CVD are not particularly high. The most outstanding observation in the 60–74 age group is that mortality from respiratory disease is nearly twice as high as the average. This may be caused by current coding practices but also a sign of quality problems in the health services; the same is true for digestive diseases. In the over 74 age group, mortality is higher than the average, particularly for men, mainly due to CVD, respiratory diseases and external causes. The rates seemingly improved from 1999-2000, but more recently have reverted, for both females and males.

Among the important findings is that the Kazakh ethnicity advantage disappears for all groups save men aged 30–59, for whom the advantage is at least halved.[1] To reiterate, a high proportion of the ‘‘Kazakh advantage’’ is due to lower accident and violent death mortality risk. Indeed, for young and elderly Kazakh women, and for older Kazakh men, mortality risks from medical causes are greater than for the population at large. The time variables show a clear pattern, indicating deterioration for the elderly.

Action has to be taken to fight the large amount of excess mortality in the region in external and alcohol related causes in young and middle adult ages. The problem of health lifestyles among urban, and especially in rural areas, should be addressed by adequate health policies. Further analyses should be devoted to the relationship between mortality and socio-economic factors on individual level.

1. The population of the Caspian region is approximately 80 % ethnically Kazakh, and slightly less than 15 % of Slavic (overwhelmingly Russian) ethnicities. Other major ethnicities include Germans, Azerbaijans and Tatars.

Bibliography

AKINER S. 2004. The Caspian. Routlege Curzon, London and New York. 2004. 405p.

ALEKSEYEV S.V. 1997. Ecology and children's health – basis for social sustainable development: III All-Russian Congress. 1997. pp. 111–117.

ANDERSON B.A., SILVER B.D. 1997. Issues of data quality in assessing mortality trends and levels in the New Independent States. In: National Research Council (Ed.). Premature Death in the new Independent States. National Academy Press, Washington, DC. 1997.

ANDERSON R. N., MININO A. M, HOYERT D. L., AND ROSENBERG H. M. 2001. Comparability of Cause of Death Between ICD-9 and ICD-10: Preliminary Estimates. National vital statistics report. Issue 49. 2001. pp. 1–32.

ANDREEV E. 1999. The dynamics of mortality in the Russian Federation. In: United Nations, Department of Economic, Social Affairs, Population Division (Ed.). Health and Mortality Issues of Global Concern. United Nations. New York. 1999. pp. 262–290.

ANDREEV K. F. 1999. Demographic surfaces: Estimation, Assessment and Presentation, with application to Danish Mortality, 1835-1995. Ph.D. thesis: University of Southern Denmark. 1999.

ARRIAGA E. E. 1984. Measuring and explaining the change in life expectancies. Demography. Chapter 21. 1984. pp. 83–96.

BAKER A., ROONEY C. 2003. Recent trends in alcohol-related mortality, and the impact of ICD-10 on the monitoring of these deaths in England and Wales. Health Statistics Quarterly. Issue 17. 2003. pp. 5–14.

BECKER C.M., BLOOM, D.E. (EDS.), 1998. Special issue on the demographic crisis in the former Soviet Union. World Development. Issue 26. 1998. pp. 11-37.

BECKER C.M., URZHUMOVA D.S. Mortality recovery and stabilization in Kazakhstan, 1995-2001. 2005. Economics and Human Biology. Issue 3. 2005. pp. 97–122.

BENNETT N.G., BLOOM D.E., IVANOV S.F. 1998. Demographic impacts of the Russian mortality crisis. World Dev. Issue 26. 1998. pp. 1921–1937.

BURCIN B., KUCERA T. 2000. Changes in Fertility and Mortality in the Czech Republic: an Attempt of Regional Demographic Analysis. In: T.Kucera, O.V.Kucerova, OB.Opara and E.Schaich (eds.): New Demographic Faces of Europe, Springer Verlag, Heidelberg. 2000, pp.371-417.

BOBAK M., MARMOT M. 1996. East-West Health Divide and Potential Explanations. In East-West Life Expectancy Gap in Europe, Environmental and Non-Environmental Determinants, edited by Hertzman C., Kelly S., and Bobak M. Dordrecht: Kluwer. Academic Publishers. 1996. pp. 17–44.

BRILL OLCOTT M. 2002. Kazakhstan, Unfulfilled Promise. Carnegie Endowment for Peace. 2002.

BRAINERD E. 2001. Economic reform and mortality in the former Soviet Union: a study of the

suicide epidemic in the 1990s. European Economic Review. Issue 45. 2001. pp. 995–1006.

BUCKLEY C. 1998. Rural and urban differentials in demographic processes: the Central Asian states. Popul. Res. Policy Rev. Issue 17. 1998. pp. 71–89.

CHARLTON J. R. H., VELEZ R. 1986. Some international comparisons of mortality amenable to medical intervention. British Medical Journal. Issue 292. 1986. pp. 295–301.

CHIANG CH. LONG. 1984. The Life Table and its Applications. Malabar: Robert E. Krieger Publishing Company. 1984.

COCKERHAM W. C. 1999. Health and Social Change in Russia and Eastern Europe. London: Routledge. 1999.

COCKERHAM W.C. 1999. Health and Social Change in Russia and Eastern Europe. Routledge, New York. 1999.

COCKERHAM W.C., HINOTE B.P., ABBOTT P., HAERPFER C. 2004. Health lifestyles in central Asia: the case of Kazakhstan and Kyrgyzstan. Social Sciences. Med. Issue 59. 2004. pp. 1409–1421.

DIAROV M. 2007. Defenseless Caspian Sea. Published in Ak Zhayk Weekly News Atyrau. 2007.

EUROPEAN COMMUNITIES. 2002. Health statistics; Atlas on mortality in the European Union. Luxembourg: Office for Official Publications of the European Communities. 2002.

GLEI D. A. 2005. The Sex Gap in Mortality: Historical Patterns Across Twenty-Four Countries. Paper to be presented at Section 203, IUSSP conference. Tours, France. 2005.

GRANOVSKY E. 2003. Problems of sustainable development of the Atyrau town and province. Assessment report for UNESCO. Almaty. 2003.

GUILLOT M. 2002. Ethnic differentials in mortality in Kyrgyzstan, 1958–99. Unpublished working paper. University of Wisconsin, Madison, Center for Demography and Ecology. 2002.

GUNDAROVA I.A. 2001. Demograficheskaya Katastrofa v Rossii: Prichiny, Mekhanizm, Puti Preodeleniya (Demographic Crisis in Russia: Causes, Mechanism, and Paths to Overcome the Crisis). URSS, Moscow. 2001.

HAYFLICK, L. 1994. How and why we age. New York: Cell Associates. 1994.

HELMERT U., STREICH W., AND BORGERS D. 2003. Regional differences in trends in life expectancy and the influence of the political and socioeconomic contexts in. International Journal of Health Services. Issue 33. 2003. pp. 669–686.

HOWE G. M. 1986. Does it matter where I live? London: Transactions of the Institute of British Geographers. Issue 11. 1999. pp. 387–414.

HUDOLEY V.V., MIZGIREV I.V. Ecologicheski opasnye factory. S-Petersburg: Publishing house. 1996. 181p.

KIBELE E. 2006. Mortality tends and patterns of Mecklenburg-Vorpommern before and after Unification. Ph.D. thesis: University of Rostock. 2005.

KENNEDY B.P., KAWACHI I., BRAINERD E. 1998. The role of social capital in the Russian mortality crisis. World Dev. Issue 26. 1998. pp. 2029–2043.

KUH D., BEN-SHLOMO Y., LYNCH J., HALLQVIST J., AND POWER C. 2003. Life course epidemiology. Journal of Epidemiology and Community Health. Issue 57. pp. 778–783.

KUNST A. E., LOOMAN C. W. N., AND MACKENBACH J. P. 1988. Medical Care and Regional Mortality Differences within the Countries of the European Community. European Journal of Population. Issue 4. 1988. pp. 223–245.

LISSICYN YU.P. Public health and medical care. Moscow: GEOTAR-MED. 2002. 128p.

MACKENBACH J. P., BOS V., ANDERSEN O., CARDANO M., COSTA G., HARDING S., REID A., VALKONEN T., AND KUNST A. E.. 2003. Widening socioeconomic inequalities in mortality in six Western European countries. International Journal of Epidemiology. Issue 32. 2003. pp. 830–837.

MAMUN A. AL. 2003. Life History of Cardiovascular Disease and Its Risk Factors. Multistate Life Table Approach and Application to the Framingham Heart Study. Amsterdam: Rozenberg Publishers. 2003.

MANSFIELD C. J., WILSON J. L., KOBRINSKI E. J., AND MITCHELL J.. 1999. Premature Mortality in the United States: The Roles of Geographic Area, Socioeconomic Status, Household Type, and Availability of Medical Care. American Journal of Public Health. Issue 89. 1999. pp. 893–898.

MOSER K., SHKOLNIKOV V., AND LEON D. A.. 2005. World mortality 1950–2000: divergence replaces convergence from the late 1980s. Bulletin of the World Health Organization. Issue 83. 2005. pp. 202–209.

MUSABEK E., SKOKBAYEVA M. Preliminary results of the first nationwide census of the population of the Republic of Kazakhstan. Bulletin of CARINFONET. Issue 6. 2001.

NOLTE E. AND MCKEE M. 2004. Does health care save lives? Avoidable mortality revisited. London: The Nuffield Trust. 2004.

NOLTE E., SCHOLZ R., SHKOLNIKOV V. M., AND MCKEE M. 2002. The contribution of medical care to changing life expectancy in Germany and Poland. Social Science and Medicine. Issue 55. pp. 1905–1921.

OMRAN. A. R. 1998. The epidemiologic transition theory revisited thirty years later. World Health Statistics Quarterely. 1998. Issue 51. pp. 99–118.

NUSSELDER W. J., MACKENBACH J. P. 2000. Lack of improvement of life expectancy at advanced ages in the Netherlands. International Journal of Epidemiology. Issue 29. 2000. pp. 140–148.

PRESTON, S. H., HEUVELINE P., AND GUILLOT M. 2001. Demography. Measuring and Modeling Population Processes. Oxford: Blackwell Publishers. 2001.

RICHARDS M. A., STOCKTON D., BABB P., AND COLEMAN M. P.. 2000. How many deaths have been avoided through improvements in cancer survival? British Medical Journal. Issue 32. 2000. pp 895–898.

RYCHTAŘIKOVA, J. 2004. The Case of the Czech Republic. Determinants of the Recent Favourable Turnover in Mortality. Demographic Research – Special Collection 2. Article 5.

Determinants of Diverging Trend in Mortality. pp. 105–138. Available at WWW: <http://www.demographic-research.org/special/2/5/s2-5.pdf>.

ROGERS R.G., HUMMER R.A., NAM C.B. 2000. Living and Dying in the USA. Academic Press, San Diego. 2000.

SHKOLNIKOV V. M., VALKONEN T., BEGUN A., AND ANDREEV E. M. 2001. Measuring inter-group inequalities in length of life. Genus LV. Issue II. 2001. pp. 33–62.

SIMONATO L., BALLARD T., BELLINI P., AND WINKELMANN R. 1998. Avoidable mortality in Europe 1995–1994: a plea for prevention. Journal of Epidemiology and Community Health. Issue 52. 1998. pp. 624–630.

SPIJKER J. A. 2004. Socioeconomic determinants of regional mortality differences in Europe. Amsterdam: Dutch University Press. 2004.

VALLIN J. 1995. Can Sex Differentials in Mortality be explained by Socio-economic Mortality Differentials? Adult Mortality in Developed Countries. From Description to Explanation. Edited by LOPEZ A. D., CASELLI G., AND VALKONEN T. OXFORD: CLARENDON PRESS. 1995. pp. 179–200.

SAVATEYEVA L.A. 1998. Teoreticheskie osnovy postroeniya i programmnaya realizaciya sistemy medico-ekologicheskoy ekspertizy dlya ocenki riska zdorov'yu ot zagryazneniya okruzhayuschey sredy. Author's abstract of scientific paper. S-Petersburg. 1998. 18p.

SHKOLNIKOV V.M., CORNIA G.A., LEON D.A., MESLE F. 1998A. Causes of the Russian mortality crisis: evidence and interpretations. World Dev. Issue 26. 1998. pp. 1995–2011.

SHKOLNIKOV V.M., LEON D.A., ADAMETS S., ANDREEV E., DEEV A. 1998B. Educational level and adult mortality in Russia: an analysis of routine data 1979 to 1994. Social Sciences. Med. Issue 47. 1998. pp. 357–369.

SHKOLNIKOV V.M., MESLE F., VALLIN J. 1996. Health crisis in Russia I. Recent trends in life expectancy and causes of death. Population: An English Selection. Vol. 8. 1996. pp. 123–154.

SMAILOV A., SHOKAMANOV YU. 2002. Ekonomika Respubliki Kazakhstan: sostoyaniie i perspektivy rosta.(Economy of the Republic of Kazakhstan: condition and prospects for growth). Ekonomika i Statistika Issue 1. 2002. pp. 14–17.

INTERNET SOURCES:

AGENCY ON STATISTICS OF THE REPUBLIC OF KAZAKHSTAN. Available at WWW: <http://www.stat.kz/en>.

HUMAN MORTALITY DATABASE (ACCESSED ON 10 FEBRUARY 2005), Population and Deaths for Kazakhstan (raw data). Available at WWW: <http://www.mortality.org>.

SIXTH CARINFONET MEETING ON COOPERATION IN THE FIELD OF HEALTH STATISTICS AND INFORMATION. Report on a WHO meeting. Bishkek, Kyrgyzstan, 9–11 October, 2001. Available at WWW: <http://www.euro.who.int>.

APPENDICES

LIST OF APPENDICES

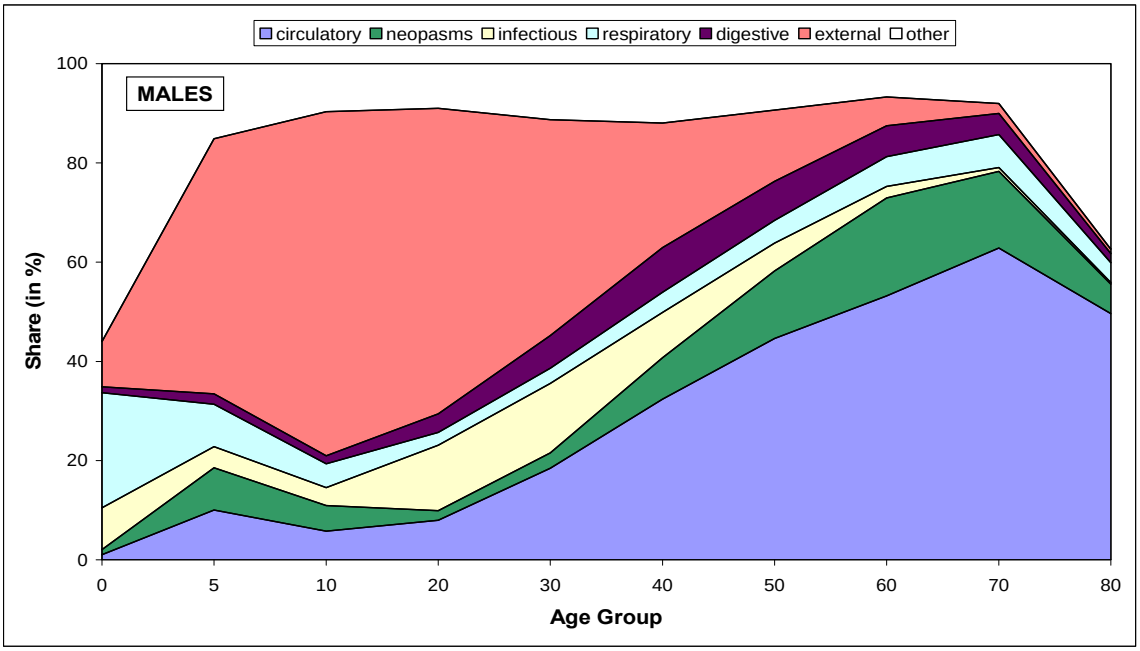
Appendix 1

Appendix 2

Appendix3

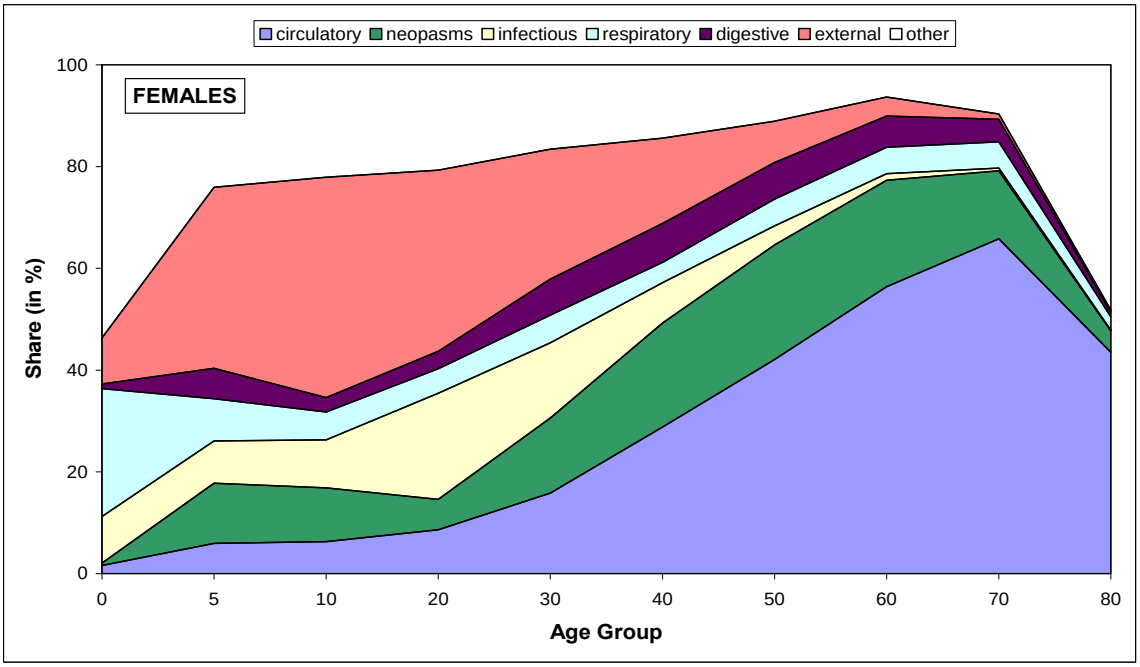
Appendix 1

Figure 1 – Distribution of causes of death across age groups in the Caspian Region in 1999–2003, males



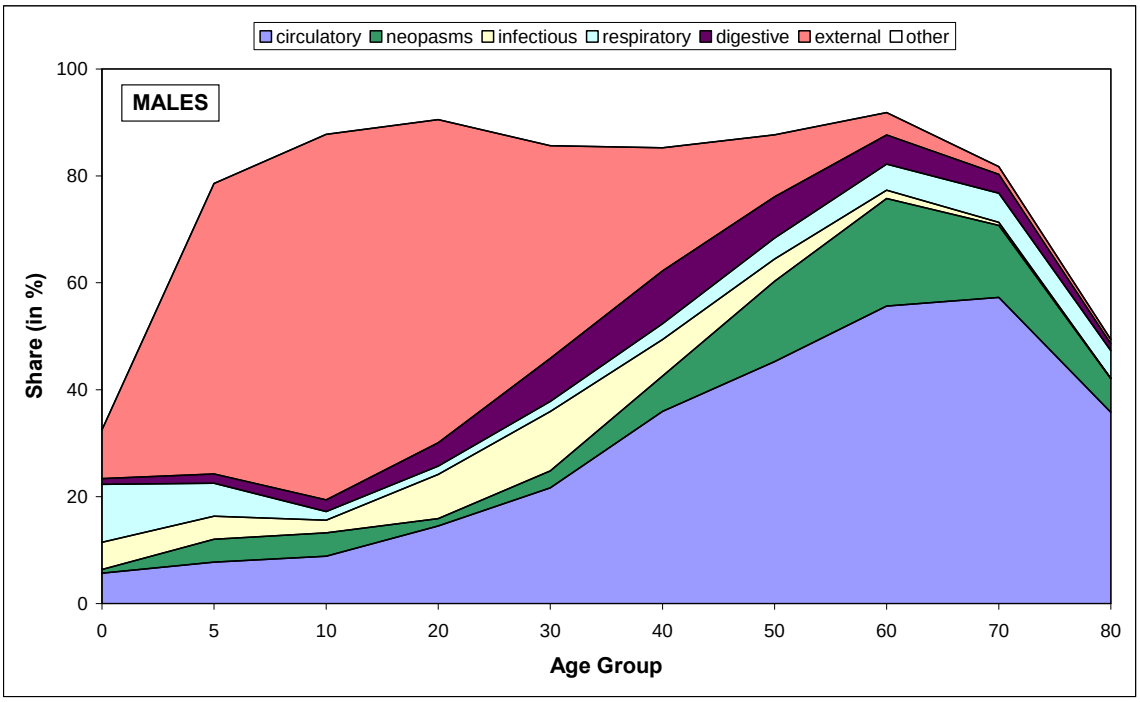
Source: Own calculations with data from Agency on Statistics of the Republic of Kazakhstan (unpublished data)

Figure 2 – Distribution of causes of death across age groups in the Caspian Region in 1999–2003, females



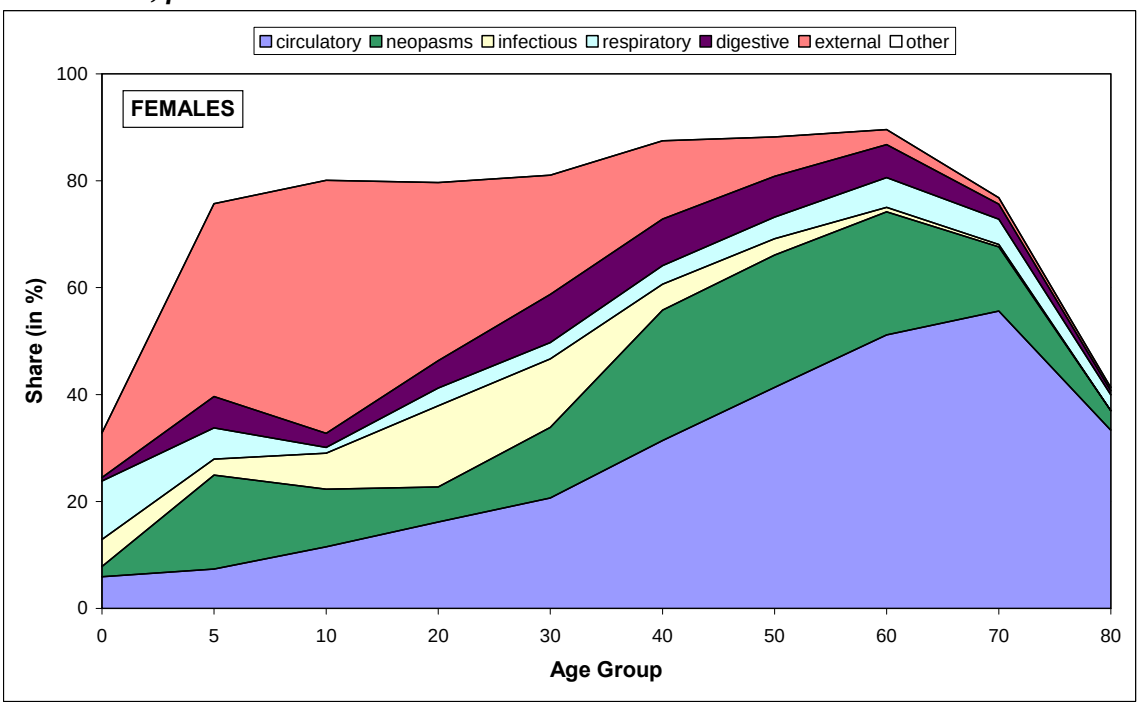
Source: Own calculations with data from Agency on Statistics of the Republic of Kazakhstan (unpublished data)

Figure 3 – Distribution of causes of death across age groups in the Caspian Region in 2004-2008, males



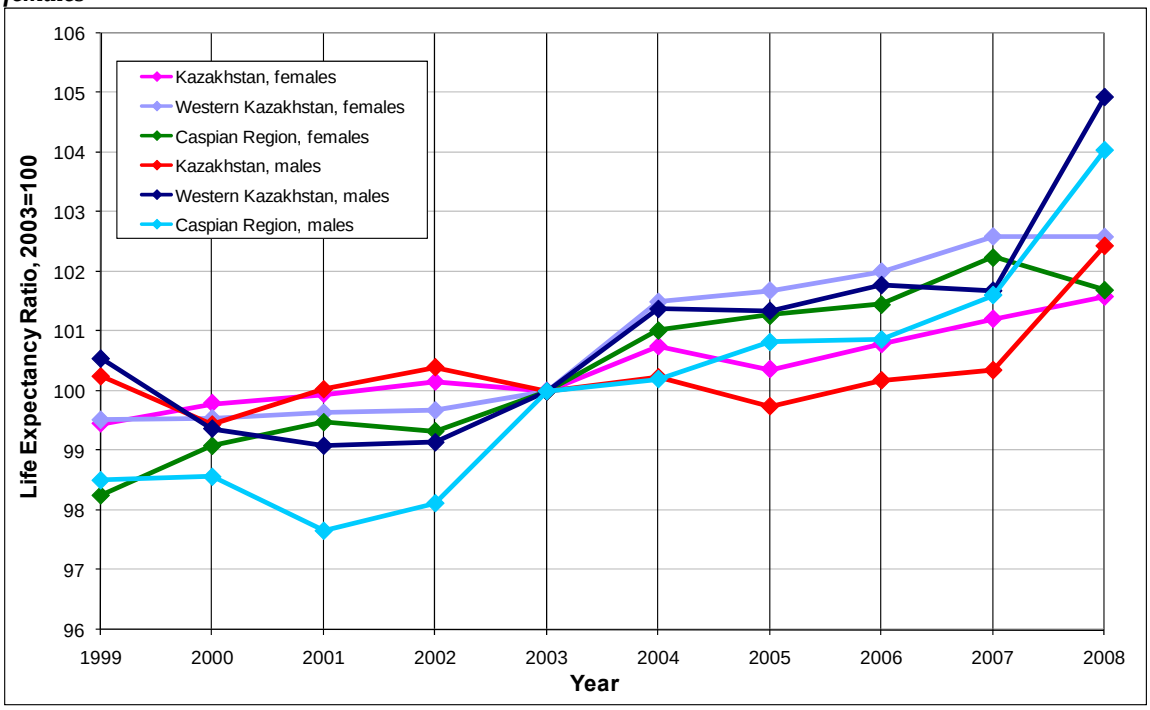
Source: Own calculations with data from Agency on Statistics of the Republic of Kazakhstan (unpublished data)

Figure 4 – Distribution of causes of death across age groups in the Caspian Region in 2004-2008, females



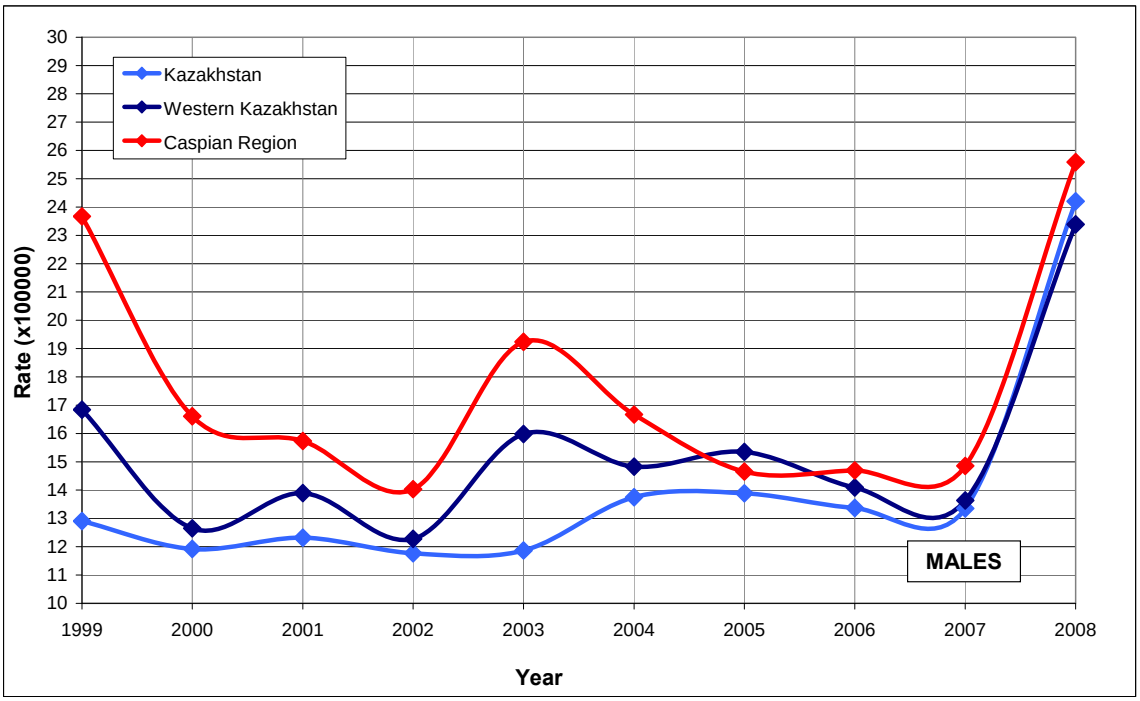
Source: Own calculations with data from Agency on Statistics of the Republic of Kazakhstan (unpublished data)

Figure 5 – Relative trend in life expectancy at birth in the Caspian region in 1999-2008 for males and females



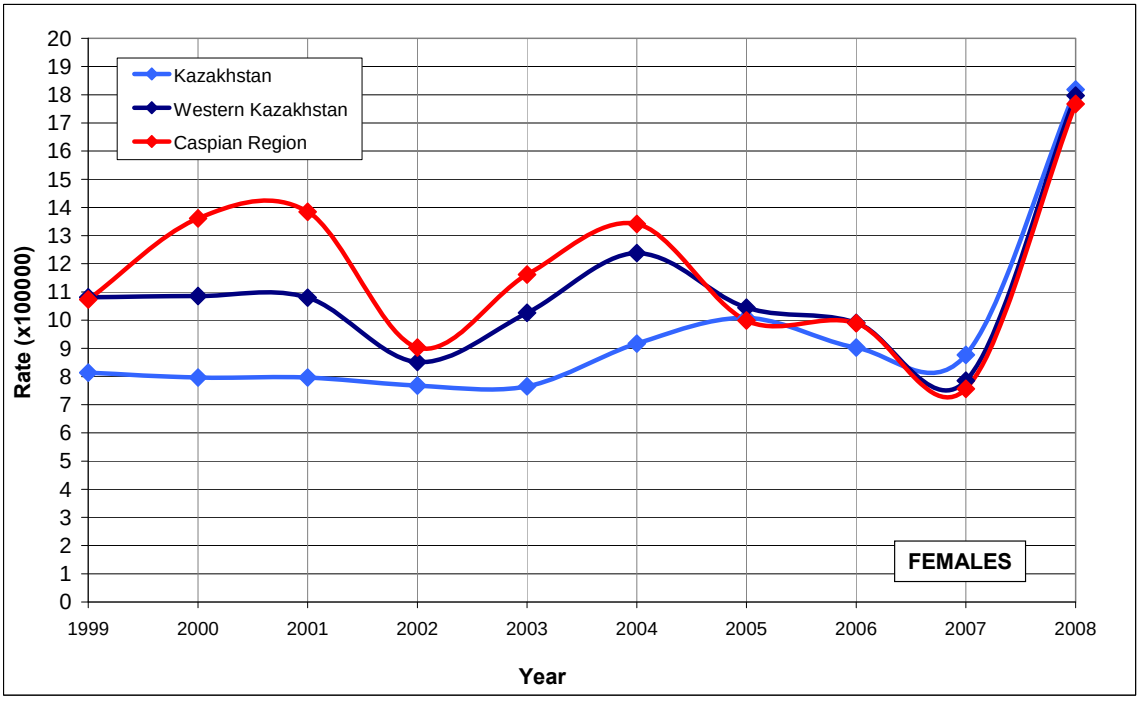
Source: Own calculations based on data of the Agency on Statistics of RK (unpublished data)

Figure 6 – Standardized death rates by certain conditions originating in the perinatal period per 100 000 in 1999-2008, males



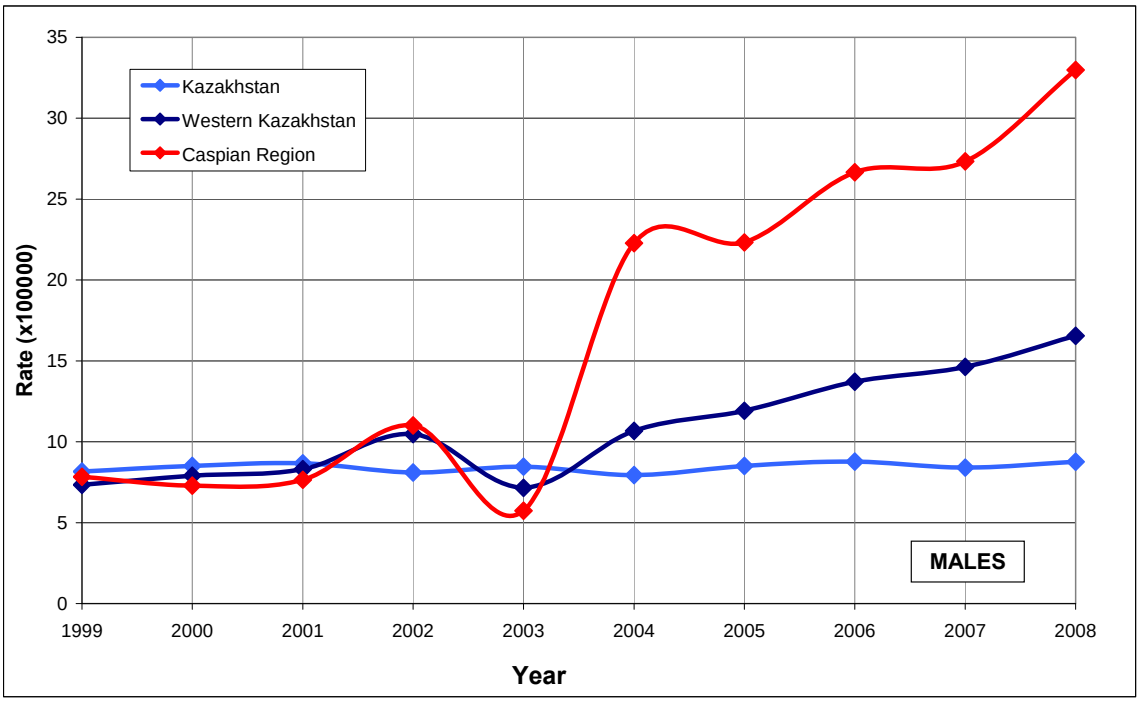
Source: Own calculations with data from Agency on Statistics of the Republic of Kazakhstan (unpublished data)

Figure 7 – Standardized death rates by certain conditions originating in the perinatal period per 100 000 in 1999-2008, females



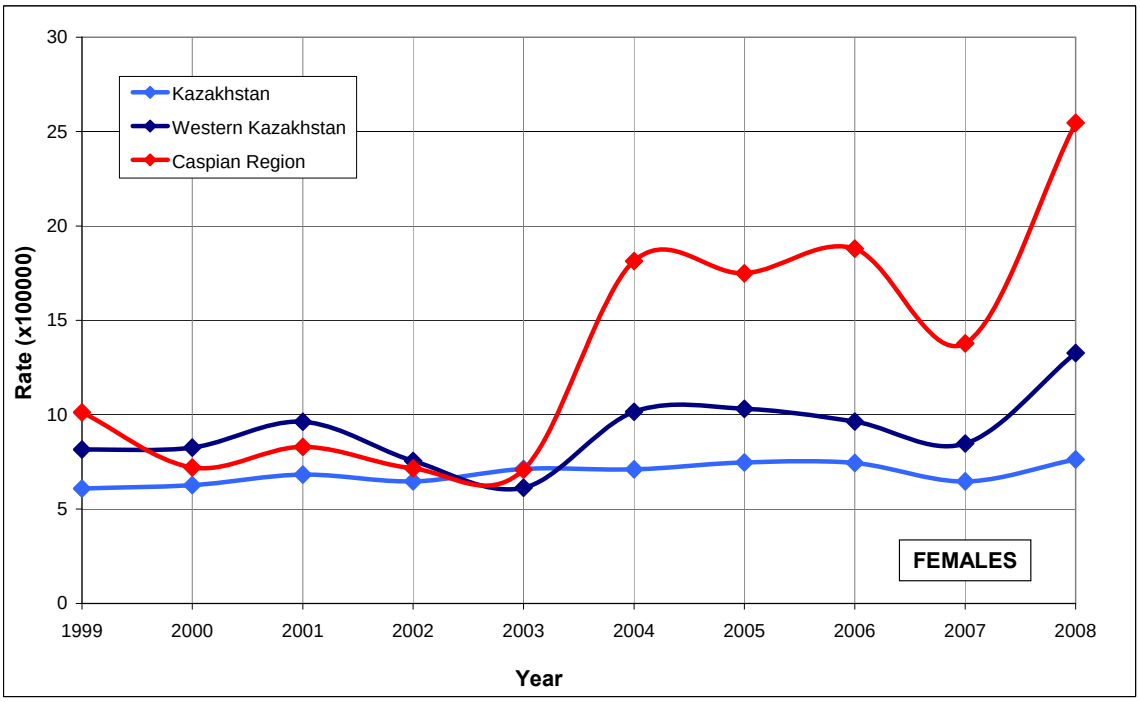
Source: Own calculations with data from Agency on Statistics of the Republic of Kazakhstan (unpublished data)

Figure 8 – Standardized death rates by congenital anomalies per 100 000 in 1999-2008, males



Source: Own calculations with data from Agency on Statistics of the Republic of Kazakhstan (unpublished data)

Figure 9 – Standardized death rates by congenital anomalies per 100 000 in 1999-2008, females



Source: Own calculations with data from Agency on Statistics of the Republic of Kazakhstan (unpublished data)

Appendix 2

Table 1 – ICD codes of causes of death as provided by the WHO Database

	Causes of death	ICD 9 code
1	All causes	000-E999
2	Infectious and parasitic diseases	001-139
3	Neoplasms	140-239
4	Circulatory diseases	280-289
5	Respiratory diseases	460-519
6	Digestive diseases	520-529
7	External causes of death	E800-E999
8	Other diseases	
9	Tuberculosis	010-018
10	Cancer of lips, oral cavity and pharynx	140-149
11	Cancer of stomach	151
12	Cancer of intestine and rectum	152-154
13	Cancer of male genital organs	175, 185-187
14	Cancer of female genital organs	174, 179-184
15	Cancer of trachea, bronchus, lung	160-165
16	Cancer of breast	174, 175
17	Diabetes mellitus	250
18	Hypertonic disease	401-405
19	Ischemic heart disease	410-414
20	Myocardial infarction	410, 411
21	Cerebrovascular disorders	430-438
22	Acute respiratory diseases	460-466
23	Influenza, flu	487
24	Liver cirrhosis	571
25	Motor vehicle accidents	E810-E819
26	Poisoning by alcohol	E860
27	Chronic alcohol disease and alcohol dependence syndrome	291, 303
28	Suicide	E950-E959
29	Homicides	E960-E969
30	Accidental drowning	E910

Source: Ministry of Health of the Republic of Kazakhstan, 1998

Table 2 – Selection of causes of death and referring ICD 9 and ICD 10 codes

ICD 10 chapter	Cause of death	ICD 10 code	ICD 9 code
I	Infectious and parasitic diseases	A00-B99	001-139
II	Neoplasms	C00-D48	140-239
II	Malignant neoplasms	C00-C97	140-208
II	Malignant neoplasms of lips, oral cavity and pharynx	C00-C14	140-149
II	Malignant neoplasms of esophagus	C15	150
II	Malignant neoplasms of stomach	C16	151
II	Malignant neoplasms of colon	C18	153
II	Malignant neoplasms of rectum and anus	C19-C21	154
II	Malignant neoplasms of	C25	157
II	Malignant neoplasms of larynx and trachea, bronchus, lung	C32-C34	161-162
II	Malignant neoplasms of breast	C50	174-175
II	Malignant neoplasms of cervix uteri	C53	180
II	Malignant neoplasms of other parts of uretus	C54-C55	179, 182
II	Malignant neoplasms of ovary	C56	183
II	Malignant neoplasms of prostate	C61	185
II	Malignant neoplasms of bladder	C67	188
II	Malignant neoplasms of kidney	C64	189
II	Malignant neoplasms of lymph, hematopoietic tissue	C81-C96	200-208
IV	Endocrine, nutritional and metabolic diseases	E00-E90	240-278
IV	Diabetes mellitus	E10-E14	250
V	Mental and behavioral disorders	F00-F99	290-319
V	Alcohol abuse and alchohol psychosis	F10	291, 303
VI	Diseases of the nervous system and the sense organs	G00-H95	320-389
IX	Diseases of the circulatory system	I00-I99	390-459
IX	Ischemic heart disease	I20-I25	410-414
IX	Acute myocardial infarction	I21-I22	410, 411
IX	Other heart diseases	I30-I33, I39-I52	420-423, 425-429
IX	Cerebrovascular diseases	I60-I69	430-438
X	Diseases of the respiratory system	J00-J99	460-519
X	Pneumonia	J12-J18	480-486
X	Chronic lower respiratory diseases	J40-J47	490-494, 496
XI	Diseases of the digestive system	K00-K93	520-579
XI	Chronic liver disease	K70, K73-K74	571.0-571.9
XIV	Diseases of the genitourinary system	N00-N99	580-629
XVIII	Symptoms, signs, abnormal findings, and ill-defined causes	R00-R99	780-799
XX	External causes of injury and poisoning	V01-Y89	E800-E999
XX	Accidents	V01-X59	E800-E929
XX	Transport accidents	V01-V99, Y85.0-Y85.9	E800-E848, E929.0-E929.1
XX	Accidental poisoning by alcohol	X45	E860
XX	Suicide and intentional self-harm	X60-X84	E950-E959
XX	Homicide, assault	X85-Y09	E960-E969
XX	Other external causes of injury and poisoning	V01-Y89	E800-E999
XXI	Other diseases or external causes of death	A00-Y99	001-E999

Source: European shortlist on causes of death (European Commission, 2002)

Table 3 – Classification of avoidable deaths with age limits and referring to ICD 9 and ICD 10 codes

	Causes of death	Age group	ICD 10 code	ICD 9 code
Causes amenable to health care				
1	Intestinal infections	0-14	A00-A09	001-009
2	Tuberculosis	0-74	A15-A19, B90	010-018, 137
3	Other infectious diseases (Diphtheria, Tetanus, Poliomyelitis)	0-74	A35, A36, A80	031, 037, 045
4	Whooping cough	0-14	A37	33
5	Septicemia	0-74	A40, A41	38
6	Measles	1-14	B05	55
7	Malignant neoplasm of colon and rectum	0-74	C18-C21	153, 154
8	Malignant neoplasm of skin	0-74	C44	173
9	Malignant neoplasm of breast	0-74	C50	174
10	Malignant neoplasm of cervix uteri	0-74	C53	180
11	Malignant neoplasm of cervix uteri and body of the uterus	0-44	C54, C55	179, 182
12	Malignant neoplasm of the testis	0-74	C62	186
13	Hodgkin's disease	0-74	C81	201
14	Leukemia	0-44	C91-C95	204-208
15	Diseases of the thyroid	0-74	E00-E07	240-246
16	Diabetes mellitus	0-49	E10-E14	250
17	Epilepsy	0-74	G40, G41	345
18	Chronic rheumatic heart disease	0-74	I05-I09	393-398
19	Hypertensive disease	0-74	I10-I13, I15	401-405
20	Ischemic heart disease	0-74	I20-I25	410-414
21	Cerebrovascular disease	0-74	I60-I69	430-438
22	All respiratory diseases, excluding influenza and pneumonia	1-14	J00-J09, J20-J99	460-479, 488-519
23	Influenza	0-74	J10-J11	487
24	Pneumonia	0-74	J12-J18	480-486
25	Peptic ulcer	0-74	K25-K27	531-533
26	Appendicitis	0-74	K35-K37	540-543
27	Abdominal hernia	0-74	K40-K81	550-553
28	Cholelithiasis and cholecystitis	0-74	K80-K81	574-575.1
29	Nephritis and nephrosis	0-74	N00-NO7, N17-N19, N25-N27	580-589
30	Benign prostatic hyperplasia	0-74	N40	600
31	Maternal deaths	All	O00-O99	630-676
32	Congenital cardiovascular anomalies	0-74	Q20-Q28	745-747
33	Perinatal deaths, all causes excluding stillbirths	All	P00-P96, A33, A34	760-779
34	Misadventures to patients during surgical medical care	All	Y60-Y69, Y83-Y84	E870-E876, E878-E879
Causes responsive to health policy				
35	Malignant neoplasm of trachea, bronchus, and lung	0-74	C33, C34	162
36	Cirrhosis of liver	0-74	K70, K73-K74	571
37	Motor vehicle accidents	All	V02-V04, V09, V12-V14, V19-V78, V80-V87, V89	E810-E825

Source: Nolte and McKee, 2004 (causes of death considered amenable to health care) and Nolte et al, 2002 (causes responsive to health policy)

Table 4 – Life expectancy at birth and 95% confidence limits in the Caspian Region, Western Kazakhstan and the Republic of Kazakhstan for males and females

	Males			Females		
	Caspian Region	**Western Kazakhstan**	**Kazakhstan**	**Caspian Region**	**Western Kazakhstan**	**Kazakhstan**
1999	58.79 (58.26; 59.33)	59.59 (59.27; 59.91)	60.63 (60.51; 60.75)	69.85 (69.30; 70.40)	70.46 (70.14; 70.79)	71.01 (70.89; 71.12)
2000	58.85 (58.32; 59.38)	58.85 (58.53; 59.17)	60.11 (59.99; 60.22)	70.47 (69.92; 71.02)	70.47 (70.14; 70.80)	71.21 (71.09; 71.33)
2001	58.28 (57.75; 58.81)	58.67 (58.35; 58.99)	60.47 (60.35; 60.59)	70.73 (70.18; 71.27)	70.54 (70.21; 70.87)	71.34 (71.23; 71.46)
2002	58.56 (58.05; 59.06)	58.71 (58.40; 59.02)	60.68 (60.57; 60.80)	70.58 (70.06; 71.11)	70.52 (70.20; 70.84)	71.47 (71.35; 71.58)
2003	59.65 (59.16; 60.13)	59.16 (58.86; 59.47)	60.40 (60.29; 60.51)	71.08 (70.58; 71.59)	70.76 (70.45; 71.07)	71.34 (71.22; 71.45)
2004	59.79 (59.30; 60.29)	60.00 (59.69; 60.31)	60.55 (60.43; 60.66)	71.80 (71.30; 72.30)	71.81 (71.51; 72.11)	71.86 (71.76; 71.97)
2005	60.17 (59.68; 60.65)	60.00 (59.69; 60.30)	60.29 (60.18; 60.40)	71.99 (71.50; 72.48)	71.97 (71.67; 72.27)	71.62 (71.51; 71.73)
2006	60.18 (59.71; 60.65)	60.25 (59.95; 60.55)	60.53 (60.41; 60.64)	72.11 (71.64; 72.58)	72.18 (71.89; 72.47)	71.90 (71.79; 72.01)
2007	60.65 (60.18; 61.12)	60.20 (59.91; 60.50)	60.63 (60.52; 60.74)	72.69 (72.22; 73.16)	72.61 (72.32; 72.89)	72.21 (72.33; 72.54)
2008	62.04 (61.58; 62.51)	62.08 (61.78; 62.38)	61.86 (61.75; 61.97)	72.28 (71.81; 72.74)	72.57 (72.28; 72.86)	72.44 (72.33; 72.54)

Source: Own calculations based on data of the Agency on Statistics of RK (unpublished data)

Table 5 - Mortality characteristics of the Republic of Kazakhstan, 1999-2008

Indicator		**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Number of Deaths		147416	149778	147876	149381	155277	152250	157121	157210	158297	152706
Mortality Crude Rate		11.2	11.7	11.5	11.7	12.1	11.9	12.2	12.1	12.1	11.3
Standardized Mortality Crude Rate[1]		11.2	11.6	11.3	11.3	11.7	11.4	11.5	11.3	11.2	10.3
Life Expectancy at Birth	**Men**	60.6	60.1	60.5	60.7	60.5	60.6	60.3	60.6	60.7	61.9
	Women	71.0	71.2	71.4	71.5	71.4	72.0	71.7	72.0	72.3	72.5
	Difference	10.4	11.1	10.9	10.8	11.0	11.4	11.4	11.4	11.6	10.6
Life Expectancy at 60	**Men**	13.5	13.4	13.6	13.5	13.1	13.6	13.5	13.8	13.8	14.3
	Women	18.0	18.1	18.3	18.2	18.0	18.5	18.4	18.6	18.8	19.0
	Difference	4.6	4.7	4.7	4.7	5.0	4.9	4.9	4.8	5.0	4.8

[1] Standard - Population age structure as 1.7.1999.

Source: Own calculations based on data of the Agency on Statistics of RK (unpublished data)

Table 6 – SDR and 95% confidence limits by causes of death in the Caspian Region, Western Kazakhstan and the Republic of Kazakhstan for males and females

Males	Caspian Region	Western Kazakhstan	Kazakhstan
All	1991.05 (1898.94; 2083.15)	1912.46 (1864.92; 1960.00)	1829.58 (1815.28; 1843.88)
Diseases of the circulatory system	794.69 (743.13; 846.26)	920.88 (886.38; 955.39)	973.75 (962.59; 984.90)
Neoplasms	225.33 (197.66; 253.00)	260.32 (244.97; 275.66)	225.48 (220.72; 230.23)
Infectious and parasitic diseases	43.30 (33.07; 53.72)	41.92 (36.78; 47.05)	36.94 (35.40; 38.49)
Diseases of the respiratory system	80.99 (64.05; 97.93)	90.02 (80.26; 99.77)	112.94 (109.42; 116.47)
Diseases of the digestive system	83.47 (69.10; 97.83)	84.20 (76.61; 91.79)	85.37 (82.68; 88.05)
Certain conditions originating in the perinatal period	25.59 (22.10; 29.07)	23.39 (21.05; 25.73)	24.20 (23.27; 25.13)
Congenital anomalies	32.99 (25.47; 40.50)	16.54 (13.73; 19.36)	8.76 (8.13; 9.39)
External causes of death	151.28 (136.02; 166.54)	175.74 (166.26; 185.21)	217.59 (213.87; 221.31)
Other causes of death	553.32 (488.84; 617.79)	99.46 (275.96; 322.95)	144.55 (140.04; 149.06)

Females	Caspian Region	Western Kazakhstan	Kazakhstan
All	1056.39 (1013.48; 1099.30)	1024;87 (1000.91; 1048.82)	1002.05 (994.12; 1009.97)
Diseases of the circulatory system	340.07 (316.54; 363.61)	494.14 (477.22; 511.06)	594.91 (588.67; 601.14)
Neoplasms	127.75 (113.97; 141.54)	129.62 (121.74; 137.50)	121.96 (119.28; 124.64)
Infectious and parasitic diseases	15.76 (11.80; 19.72)	14.05 (11.76; 16.34)	12.14 (11.36; 12.91)
Diseases of the respiratory system	50.61 (41.40; 59.78)	37.25 (32.89; 41.61)	36.29 (34.84; 37.75)
Diseases of the digestive system	35.20 (27.88; 42.53)	38.26 (33.99; 42.53)	42.68 (41.10; 44;26)
Certain conditions originating in the perinatal period	17.67 (14.70; 20.64)	17.97 (15.86; 20.08)	19.16 (18.31; 20.01)
Congenital anomalies	25.46 (20.18; 30.75)	13.27 (11.13; 15.41)	7.56 (7.00; 8.12)
External causes of death	41.58 (35.05; 48.11)	45.67 (41.49; 49.84)	55.59 (53.90; 57.28)
Other causes of death	402.27 (372.87; 431.68)	235.64 (222.12; 247.16)	111.42 (108.68; 114.16)

Source: Own calculations based on data of the Agency on Statistics of RK (unpublished data)

Appendix 3

Figure 5 – Mortality Certificate on Adult Death

Код учреждения по ОКПО ____ _____

Министерство здравоохранения Республики Казахстан Наименование организации		Медицинская документация Форма № 106/у-03 Утверждена приказом Минздрава РК от 8 сентября 2003 г. № 664

ВРАЧЕБНОЕ СВИДЕТЕЛЬСТВО О СМЕРТИ № _____

Дата выдачи «_____» _____ 20____ г.

(предварительное, окончательное, взамен предварительного, окончательного № _____)

1. Фамилия, имя, отчество: _____
2. Пол: мужской – 1, женский – 2
3. Дата рождения: год _____, месяц _____, число _____
4. Дата смерти: год _____, месяц _____, число _____
5. Для детей, умерших в возрасте от 7 дней до 1 месяца: доношенный – 1, недоношенный – 2
6. Для детей, умерших в возрасте от 7 дней до 1 года: масса (вес) при рождении _____ граммов – 1, число месяцев _____ и дней _____ жизни – 2, по счету _____ ребенок у матери – 3, возраст матери _____ – 4

*7. Место постоянного жительства:
область/город респ. значения _____
район/город обл. значения _____
округ _____
населенный пункт _____ (город – 1, село – 2)
улица _____, дом _____, корпус _____, кв._____

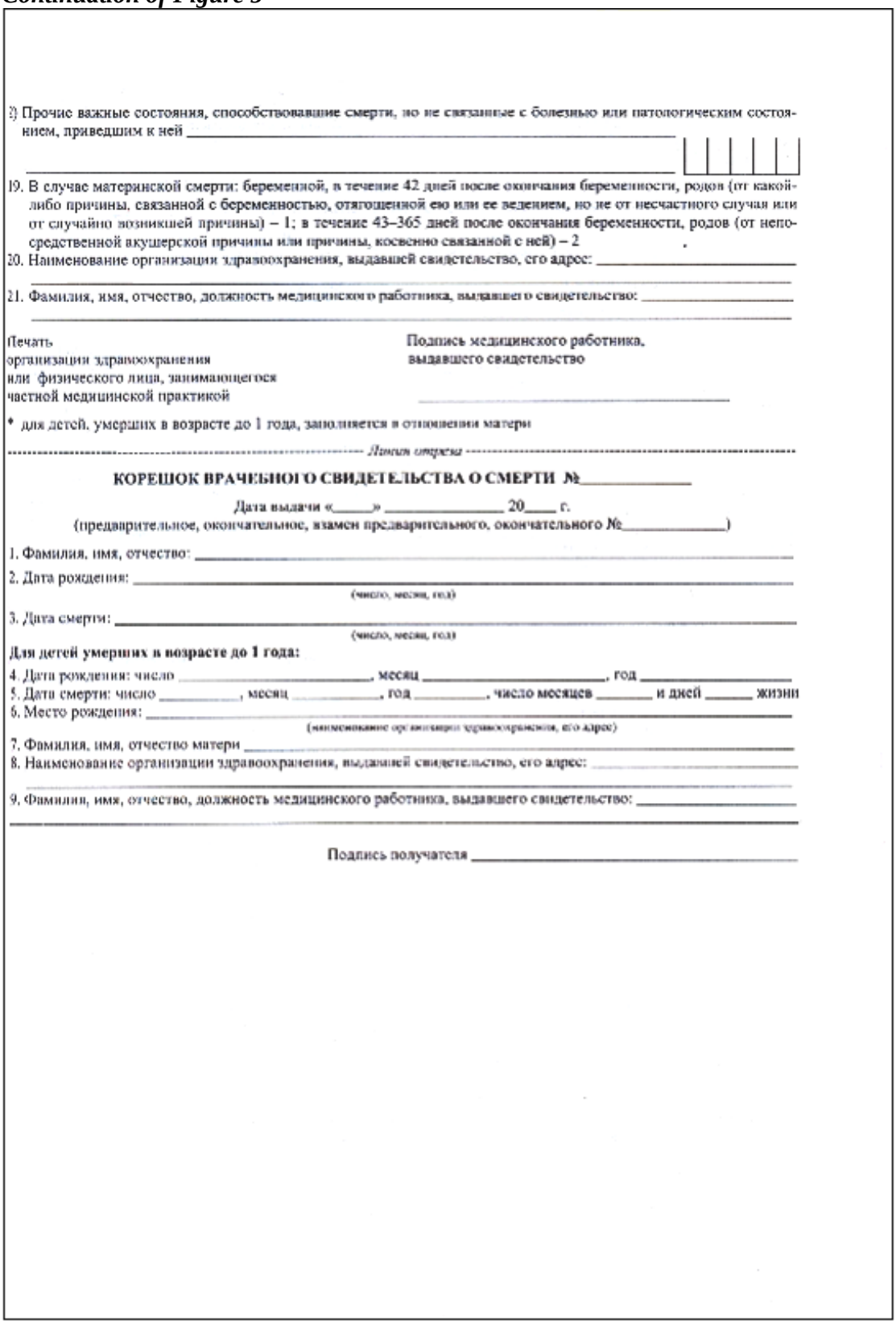
8. Место смерти:
область/город респ. значения _____
район/город обл. значения _____
округ _____
населенный пункт _____ (город – 1, село – 2)
улица _____, дом _____, корпус _____, кв._____

9. Смерть наступила: в стационаре – 1, дома – 2, в другом месте – 3
10. Национальность: _____
11. Семейное положение: состоял(а) в браке – 1, не состоял(а) в браке – 2, вдов(а) – 3, разведен(а) – 4, не известно – 5
12. Образование: высшее – 1, незаконченное высшее – 2, среднее специальное – 3, среднее общее – 4, неполное среднее – 5, начальное – 6, не известно – 7
13. Место работы и должность: _____
14. Причина смерти: заболевание – 1, несчастный случай вне производства – 2, несчастный случай на производстве – 3, убийство – 4, самоубийство – 5, не установлено – 6
15. В случае смерти от несчастного случая, отравления или травмы:
а) дата: год _____, месяц _____, число _____
б) при несчастных случаях вне производства вид травмы: бытовая – 1, уличная, кроме дорожно-транспортной – 2, дорожно-транспортная – 3, школьная – 4, спортивная – 5, прочее – 6;
в) место и обстоятельства, при которых произошла травма, отравление _____
16. Причина смерти установлена: врачом, только констатировавшим смерть – 1, лечащим врачом – 2, фельдшером – 3, патологоанатомом – 4, судебно-медицинским экспертом – 5
17. Я, _____
(фамилия, имя, отчество)
_____
(должность)
удостоверяю, что на основании: осмотра трупа – 1, записей в медицинской документации – 2, предшествующего наблюдения – 3, вскрытия – 4 мною определена последовательность патологических процессов (состояний), приведших к смерти, и установлена следующая причина смерти
18. Причина смерти:

	Дата (болезни) начало	окончание
I) а) _____ (болезнь или состояние, непосредственно приведшее к смерти)		
б) _____ (патологические состояния, приведшие к возникновению непосредственной причины)		
в) _____ (основная причина смерти указывается последней)		
г) _____ (внешние причины при травмах и отравлениях)		

28

Continuation of Figure 5



2) Прочие важные состояния, способствовавшие смерти, но не связанные с болезнью или патологическим состоянием, приведшим к ней _____

_____

19. В случае материнской смерти: беременной, в течение 42 дней после окончания беременности, родов (от какой-либо причины, связанной с беременностью, отягощенной ею или ее ведением, но не от несчастного случая или от случайно возникшей причины) – 1; в течение 43–365 дней после окончания беременности, родов (от непосредственной акушерской причины или причины, косвенно связанной с ней) – 2 .

20. Наименование организации здравоохранения, выдавшей свидетельство, его адрес: _____

_____

21. Фамилия, имя, отчество, должность медицинского работника, выдавшего свидетельство: _____

_____

Печать
организации здравоохранения
или физического лица, занимающегося
частной медицинской практикой

Подпись медицинского работника,
выдавшего свидетельство

_____

* для детей, умерших в возрасте до 1 года, заполняется в отношении матери

---------- *Линия отреза* ----------

КОРЕШОК ВРАЧЕБНОГО СВИДЕТЕЛЬСТВА О СМЕРТИ №_____

Дата выдачи «_____» _____ 20____ г.
(предварительное, окончательное, взамен предварительного, окончательного №_____)

1. Фамилия, имя, отчество: _____

2. Дата рождения: _____
(число, месяц, год)

3. Дата смерти: _____
(число, месяц, год)

Для детей умерших в возрасте до 1 года:

4. Дата рождения: число _____, месяц _____, год _____
5. Дата смерти: число _____, месяц _____, год _____, число месяцев _____ и дней _____ жизни
6. Место рождения: _____
(наименование организации здравоохранения, его адрес)
7. Фамилия, имя, отчество матери _____
8. Наименование организации здравоохранения, выдавшей свидетельство, его адрес: _____

_____

9. Фамилия, имя, отчество, должность медицинского работника, выдавшего свидетельство: _____

_____

Подпись получателя _____