CHARLES UNIVERSITY IN PRAGUE

Faculty of Science

Department of Demography and Geodemography

REGIONAL MORTALITY DIFFERENTIATION IN KAZAKHSTAN
(1999-2008)

Ph.D. study program in Demography
Summary of Ph.D. Thesis

Shynar Tuleshova

Supervisor: RNDr. Boris Burcin, Ph.D.

Prague 2011

REGIONAL MORTALITY DIFFERENTIATION IN KAZAKHSTAN (1999-2008)

Abstract

The objective of the submitted doctoral thesis is to examine the mortality variation across regions of Kazakhstan and to investigate the explanatory factors of regional mortality differences in the period 1999-2008. Population and mortality data for the period 1999-2008 and the explanatory variables for the periods 1999, 2000, 2007, 2008 were obtained from Agency of Statistics of the Republic of Kazakhstan.

The work analyzed the development of regional differentiation in overall mortality level and mortality level by age groups through definite statistical indicators, and examined the regional mortality trends by sex, age groups, and selected leading causes of death in the observed period. The intention was to show the regional mortality differences in the periods 1999-2000 and 2007-2008 and the changes between observed periods.

The special attention is paid to assessing the contribution of age groups and selected main causes of death to the change in overall mortality level in the regions between examined periods.

The observation of regional differences in measures of inequality in age at death in respect to length of life was the special way of examination the regional mortality inequalities.

The multiple regression model was used to investigate the variables explaining the regional variation in overall mortality level while canonical correlation method was applied to examine the variables explaining the regional variation in mortality level by age groups in the periods 1999-2000 and 2007-2008.

The results of the work suggested the increase of regional mortality differentiation which was explained by substantial mortality decline in municipal cities and the comparative stagnation of mortality improvement in other regions. Mortality differences across regions were determined by regional socio-economic and demographic inequalities in the observed period.

Key words: Kazakhstan, Regional differences, Mortality, Factors of mortality, Regression, Correlation

Content of the Summary thesis

1. Introduction

In contemporary demography the study of regional mortality differentiation within country is a matter of growing concern. The main reason of this evidence is that the observation of regional mortality variation affords to perform better mortality pattern in the country. Kazakhstan is one of the post-soviet Central Asian countries whose territory is considered to be one of the biggest in the world. 14 regions (oblasts) and 2 municipal cities of the country are differentiated not only by natural resources and economic status but also by ethnical composition and ecological features. These differences definitely would have the possible effect on regional mortality inequalities in the country. This topic was briefly issued before by researchers C. Becker and D. Urzhumova (2005) for the period 1995-2001. Authors concluded that there were the stark regional differences − mortality decline was underway in many areas with substantial economic recovery, while elsewhere there had been no discernable improvement. Our study period 1999-2008 coincides with the time of economic growth in the country. In this period mortality level slightly improved in the country. Life expectancy at birth for males increased for 1.0 year (from 60.2 in the period 1999-2000 to 61.2 in the period 2007-2008) while female life expectancy at birth increased for 1.3 years (from 70.7 years in the period 1999-2000 to 72.0 in the period 2007-2008). In this sense it would be important to examine if all regions demonstrated the improvement or the stark regional differences existed as it was noted before. Hence, it would be reasonable to observe what factors were responsible for regional mortality differences.This examination is fundamentally important to fill the wide knowledge gap in research of regional mortality differentiation within Kazakhstan. Moreover, the observation would identify the fact that mortality is higher in one region than in another emphasizes the urgency of solving the underlying problems in those regions where mortality is highest and it suggests that improvements can indeed be made.

2. Aim of the study

The main *goal* of the thesis is to analyze the regional mortality differentiation in the period 1999-2008 focusing on the changes in regional mortality differences between the periods 1999-2000 and 2007-2008 and identifying the socio-economic and demographic factors of

regional differences in both periods. From the main goal we define the following *research objectives* of the thesis:

- − to observe the development of regional mortality variation in the period 1999-2008
- − to examine the regional mortality trends by sex, age and causes of death in the period 1999-2008;
- − to assess the contribution of age groups and causes of death to the change in life expectancy at birth in the regions between the periods 1999-2000 and 2007-2008;
- − to analyze the changes in association of regional differences in expectation of life and measures of inequality in age at death between the periods 1999-2000 and 2007-2008;
- − to investigate the socio-economic and demographic factors of regional differentiation in overall mortality level and mortality by age groups in the periods 1999-2000 and
- − 2007-2008;

3. Materials and methods

Data for the thesis were compiled from the Agency of Statistics of the Republic of Kazakhstan. These are population and mortality data in single and five year age intervals for males and females for all regions for the years between 1999 and 2008. Population data was available for the beginning and the middle of each year. Cause of death data for 19 broad groups of causes by sex and age for all regions and years was also obtained from the Agency. To determine the factors of regional mortality differentiation the socio-economic and demographic indicators were obtained for the years 1999, 2000, 2007, and 2008 from the Agency by means of application of the author and the electronic statistical publications of the Agency.

As the applied methods were in different character they were divided into main groups: basic demographic, advanced demographic, statistical, and cartographic. Life table construction and the standardization method were applied as the basic demographic methods. Life table was constructed using the software application DeRaS (Burcin, Hulíková Tesárková, Komanek, 2011). The software along with the life table construction smoothed and extrapolated mortality rate in old ages (applying Kannisto model for age interval 60-84). To examine the regional mortality differentiation by cause of death we used the direct

method of standardization. European "old" standard population was taken as the standard population.

The methods of decomposition, the calculation of measures of inequality in age at death (losses of expected lifetime, Gini coefficient) were presented as the advanced demographic methods. To assess the contributions of age groups and the selected main causes of death to the change in life expectancy at birth between the periods 1999-2000 and 2007-2008 the methods proposed by R. Pressat and J. Pollard were applied.

Factor analysis was selected to group the probability of dying for five-year age groups into broader ones. Multiple regression and canonical correlation analyses were selected to investigate the determinants of regional differentiation in overall mortality level and mortality by age groups. The cartographic method is used to create maps to show the regional differentiation of selected socio-economic and demographic indicators with the help of geographical tool ArcGIS 9.

4. Results and discussion

4.1. Regional mortality trends in Kazakhstan in 1999-2008

In the period 1999-2008 life expectancy at birth for both sexes increased in the country. However, male life expectancy at birth slightly decreased in central regions, northern regions North Kazakhstan, Kostanai, and southern region Almaty (see Figures 1a and 1b). The decrease was partly explained by mortality increase from circulatory system diseases and external causes in age group 20-64 in the regions.

The biggest increase of life expectancy at birth for both sexes was observed in Astana, Almaty cities, and western regions (see Figures 1a-2b) which were also partly explained by the big mortality decrease from abovementioned causes in age group 20-64. Mortality level from neoplasm in the observed age group decreased in all regions with biggest decrease in Astana, Almaty cities, and western regions.

Mortality level in age group 0-4 substantially decreased for both sexes in the regions except South Kazakhstan region and Almaty city. In these regions the level increased with the slight increase in Almaty city. The improvement of mortality level in this age group was partly explained by mortality decrease from certain infectious and parasitic diseases, respiratory system diseases.

6

Figure 1a − Life expectancy at birth, the first group of regions, 1999-2008, males
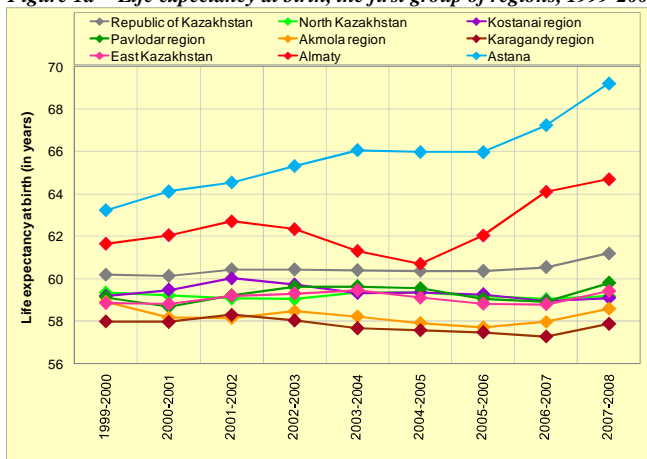
Figure 1b − Life expectancy at birth, the second group of regions, 1999-2008, males
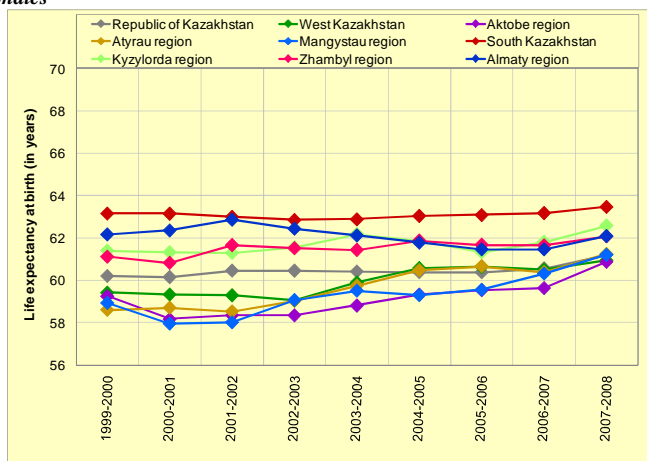
7

Figure 2a − Life expectancy at birth, the first group of regions, 1999-2008, females
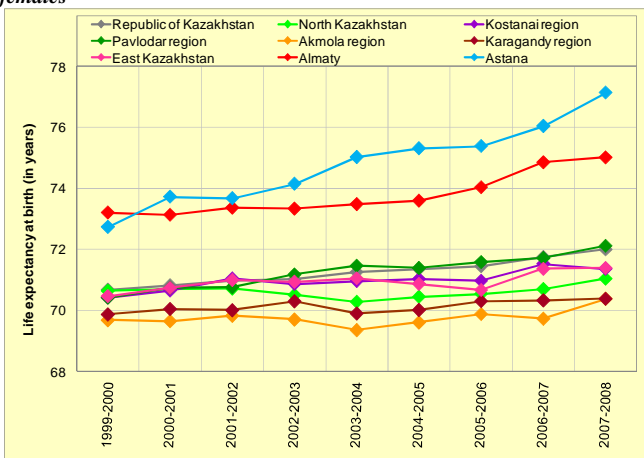
Figure 2b − Life expectancy at birth, the second group of regions, 1999-2008, females
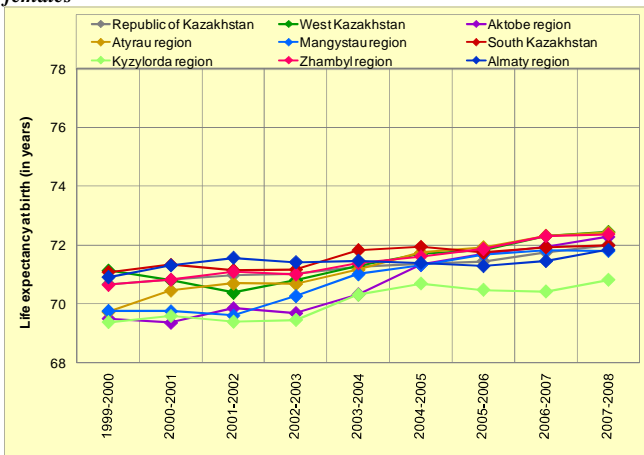
8

In age group 5-19 mortality level did not indicate the substantial change in the regions. However, in favourable Astana city the level slightly increased for both sexes.

In age group 65-84 mortality level for both sexes decreased in the regions except Mangystau region for males. Male mortality increase in Mangystau region was partly explained by mortality increase from neoplasm in observed age group. In this age group female mortality level from circulatory and respiratory system diseases also decreased in the country as well as all regions. Male mortality level from circulatory system diseases increased in Kyzylorda, from respiratory system diseases in West Kazakhstan region. It is worth to note that Astana and Almaty cities had the lowest level of mortality in observed age group among all regions in the period 1999-2000 with its further improvement over time.

4.2 Factors of regional mortality differentiation in the periods 1999-2000 and 2007-2008

In the period 1999-2000 male life expectancy at birth was positively related to gross regional product (b = 0.0043. stb = 1.7906) and proportion of poor population, and negatively related to crude divorce rate (b = − 1.3860, stb = − 0.4889) and the volume of industrial production (b = − 0.0031, stb = − 2.2018) (see Table 1).

Table 1− Parameter and Standardised Estimates of factors, 1999-2000, males

| Parameter Estimates						
Variable	**DF**	**Parameter Estimate**	**Standard Error**	**t Value**	**Pr > |t|**	**Standardized Estimate**
Intercept	1	58.3080	0.9404	62.00	<.0001	0
INDPROD	1	-0.0031	0.0004	-8.59	<.0001	-2.2018
GRP	1	0.0043	0.0006	7.07	<.0001	1.7906
POVERTY	1	0.0833	0.0146	5.72	0.0001	0.9169
DIV	1	-1.3860	0.4187	-3.31	0.0070	-0.4889

Source: Author's calculations based on the data from the Agency of Statistics of the Republic of Kazakhstan

In the examined period female life expectancy at birth was positively related to the gross regional product (b=0.0026, stb=1.6589), and negatively associated with the volume of industrial production (b= -0.0015, stb= − 1.6466) and crude divorce rate (b= − 0.6591, stb= − 0.3646) (see Table 2).

Table 2 − Parameter and Standardised Estimates of factors, 1999-2000, females

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Standardized Estimate
Intercept	1	70.35	0.4681	150.30	<.0001	0
INDPROD	1	-0.0015	0.0002	-6.33	<.0001	-1.6466
GRP	1	0.0026	0.0004	5.68	0.0001	1.6589
DIV	1	-0.6591	0.3238	-2.04	0.0645	-0.3646

Source: Author's calculations based on the data from the Agency of Statistics of the Republic of Kazakhstan

In the period 2007-2008 male life expectancy at birth was positively associated with the highest educational attainment (b=0.0200. stb=0.9400) and negatively related to crude divorce rate (b= − 2.0384, stb= − 0.5117). The higher value of standardised regression coefficient for the variable HIGHEDU (stb=0.7806) compared to the variable DIV indicated the higher contribution of highest educational attainment to male life expectancy at birth (see Table 3).

Table 3 − Parameter and Standardised Estimates of factors, 2007-2008, males

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Standardized Estimate
Intercept	1	61.62	1.0548	58.42	<.0001	0
HIGHEDU	1	0.0200	0.0023	8.55	<.0001	0.9310
DIV	1	-2.0384	0.4380	-4.65	0.0005	-0.5117

Source: Author's calculations based on the data from the Agency of Statistics of the Republic of Kazakhstan

The values of regression and standardised regression coefficients for the variable HIGHEDU indicated that the highest educational attainment was positively (b=0.0117. stb=0.8930) related to (see Table 4) female life expectancy at birth in the period 2007-2008.

10

Table 4 − Parameter and Standardised Estimates of factors, 2007-2008, females

		Parameter Estimates				
Variable	**DF**	**Parameter Estimate**	**Standard Error**	**t Value**	**Pr > |t|**	**Standardized Estimate**
Intercept	1	69.48	0.4148	167.5	<.0001	0
HIGHEDU	1	0.0117	0.0016	7.43	<.0001	0.8930

Source: *Author's calculations based on the data from the Agency of Statistics of the Republic of Kazakhstan*

5. Conclusion

The thesis examined the regional mortality differentiation in the period 1999-2008 accentuating on the periods 1999-2000 and 2007-2008 and the changes between two periods. The explanatory factors of regional mortality differences were investigated in the observed periods.

One conclusion can be drawn from the results of analyses employed in the thesis is that regional mortality variation increased for both sexes with the bigger increase for males in the country during the examined decade. This extension was explained by the further decrease of mortality level in municipal cities, comparatively bigger improvement in western oil extracting regions and the stagnation in the regions of other parts.

In the period 1999-2000 regional differentiation of overall mortality level for both sexes was positively related to gross regional product as and indicator of living standard, and negatively related to the volume of industrial production as an indicator of possible environmental degradation and the occupation of population in unhealthy working conditions in industrial and oil-extracting regions, and the crude divorce rate.

In the period 2007-2008 regional differentiation of overall mortality level for both sexes was positively related to proportion of highly educated population. Overall male mortality differentiation was also negatively related to divorce level.

6. Principal references

ANDERSON, F., SCHLATTMANN, P., ROLL, S., MULLER-RIEMENSCHNEIDER, F., BINTING, S., WILLICH, S.N. (2010). Regional variation of mortality from ischemic heart disease in Germany from 1998 to 2007. *Clinical Research in Cardiology* 99:511–518.

ANTONOVA, O.I. (2007). Regionalnaya differentsiatsiya smertnosti ot vneshnyh prichin. *Voprosyi statistiki* 10: 17-21.

BECKER, C.M., URZHUMOVA, D.S. (2005). Mortality recovery and stabilization in Kazakhstan, 1995–2001. *Economics and Human Biology* 3: 97–122.

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

CASELLI, G. and Vallin, J. (2006). Geographic Variations of Mortality. In: Caselli, G., Vallin, J. and Wunsch, G. *Demography: Analysis and Synthesis*. Volume II. New York: Elsevier: 207-234.

COCKERHAM, W.C., HINOTE, B. P., ABBOTT, P. (2006). Psychological distress, gender, and health lifestyles in Belarus, Kazakhstan, Russia, and Ukraine. *Social Science & Medicine* 63: 2381–2394.

EKSLER, V., LASSARRE, S., THOMAS, I. (2008). Regional analysis of road mortality in Europe. *Public Health* 122: 826-837.

FULTON, M., ADAMS, W., W.LUTZ, and M.F.OLIVER (1978).Regional variations in mortality from ischaemic heart and cerebrovascular disease in Britain. *British Heart Journal* 40: 563-568.

KALEDIENE, R., PETRAUSKIENE, J. (2000). Regional life expectancy patterns in Lithuania. *European Journal of Public Health* 10 (2): 101-104.

RYCHTARIKOVA, J. (2002). Czech mortality patterns: the past, the present, and regional dissimilarities. *Geografie Sbornik CGS* 107(2): 156-170.

SPIJKER, J. (2004). *Socioeconomic Determinants of Regional Mortality Differences in Europe*. Amsterdam: Dutch University Press.

SPIJKER, J., WISSEN, L.V. (2009). Socioeconomic determinants of male mortality in Europe: the absolute and relative income hypotheses revisited. *Genus* LXVI (1): 37-61

Curriculum Vitae of the author
I. General information
Name:	Shynar Tuleshova (Pazylbekovna) (F)
Address:	Mametova 6, Aiteke bi, Kyzylorda, Kazakhstan
	+7 (724 38) 21 3 66
Telephone:	
Date of birth:	03.04.1982
E-mail:	shinar-82@mail.ru
Nationality:	kazakh

II. Academy formation
SP:	History of Kazakhstan with second specialty foreign Language (English)
Institution:	L. Gumilyov Eurasian National University, Astana, Kazakhstan
Years:	1998-2003
MA:	"History"
Institution:	L. Gumilyov Eurasian National University, Astana, Kazakhstan
Years:	2003-2005
PhD:	"Demography"
Institution:	Charles University in Prague, the Czech Republic
Years:	Since 2007

III. Professional experience

Institution:	L. Gumilyov Eurasian National University, Astana, Kazakhstan
Charge:	Teacher of History of Kazakhstan
Period:	10/2005–06/2006
Institution:	Trade – economic college, Astana, Kazakhstan
Charge:	Teacher of Humanitarian disciplines
Period:	09/2003– 08/2007

IV. Participation:

09/06/2007 Workshop-training "Introduction of training programs in demography at Kazakhstani Universities" Demographers Association of Kazakhstan, United Nations Development Programme Kazakhstan, UNFPA, Karkaraly (Kazakhstan)

VI. List of selected publications

Tuleshova, Sh. (2010). *Mortality Trends in Kazakhstan in 1999-2008: on national and regional level.* Paper presented at the 2nd Demographic Conference of Young Demographers, Actual Demographic research of Young Demographers (not only) in Europe, Prague, 17 February.

Tuleshova, Sh. (2010). *Mortality Trends in Kazakhstan in 1999-2008: analysis by cause of death.* Paper presented at the Ethno-demographic processes in Kazakhstan and adjacent territories, International scientific-practical conference, Ust-Kamenogorsk, 28 May.