REGIONAL DISPARITIES IN ALL-CAUSE MORTALITY IN BULGARIA FOR THE PERIOD 2000 - 2012

Virginia Atanasova, Iskra Mircheva, Klara Dokova

Department of Social Medicine and Health Care Organization,
Medical University of Varna

ABSTRACT

Health inequalities are an exclusive focus of scientific research in all European countries. Subnational studies have the potential to detect regional variations, to evaluate health problems, and to plan policies for reducing them. This study presents regional all-cause mortality disparities in Bulgaria with crude and standardized rates for a period of 13-years, from 2000 to 2012.

Keywords: *regional mortality disparities, direct age-adjustment (direct standardization), relative risk, absolute risk*

INTRODUCTION

Health inequalities are a specific focus of health research in all European countries. During the last two decades the reduction of health inequalities is a topic of discussion, consensus documents and progress monitoring of each member state of the European Union. Comparisons are most often made between countries, but mean values for countries can mask substantial intra-country variations (Bonneux et al., 2010; Shaw et al., 2000). Mean values can sometimes be misleading for the regional level. If moratlity is high to the north and low to the south, the mean values for a country will not be representative for both parts (Kibele E., et al., 2015).

Studies on a subnational level provide opportunity for discovering regional inequalities and their potential explanations. These might be spatial (geographical) differences, structural differences in the population composition, socio-economic, ecological factors etc.

Regional health inequalities have a substantial potential for revealing and evaluating regional health problems and priorities and planning policies on a regional level.

The present study focuses on regional differences in all-cause mortality in Bulgaria presented with crude and age-standardized indicators for a 13-year period.

MATERIALS

Data for the size of the population and the number of deaths by gender, five-year age groupsfor the 28 regions, and for each year in the period 2000-2012 is provided from the National Statistical Institute (NSI).

METHODS

Direct age-standardization of mortality is performed for the needs of between-region comparisons. European Standard Population as revised in 2013, and proposed by Eurostat for statistical analysis, is used as a standard (Revision of the European Standard Population, 2013). The same standard

Address for correspondence:
Virginia Atanasova
Medical University of Varna
Department of Social Medicine and Health Care Organization
e-mail: atanasova.virginia@gmail.com

Received: February 29, 2016
Accepted: March 9, 2016

weights are used for standardizing the rates for men and women.

Crude and direct age-standardized all-cause mortality rates with 95% confidence intervals (CI) are estimated for each of the 28 regions in Bulgaria and separately by gender.

For the assessment of the extent of between regional variation, relative risks (RR) with 95% CI are estimated, dividing the rates of the region with the highest and the region with the lowest mortality, separately for men and women, and for both genders.

For defining the absolute level of between-region variation in all-cause mortality absolute risk (AR) with 95% confidence intervals is estimated as a difference between the rates of the regions with the highest and the lowest mortality.

The difference between age-standardized and crude rates is assessed with the non-parametric Wilcoxon rank test.

The trend in crude and age-standardized all-cause mortality for the period 2000–2012, by region is also analyzed.

The data is organized and presented in tables and graphs with MS Offise Excel 2010.

For the statistical analyses IBM SPSS for WINDOWS ver. 22.0.0 and StatsDirect ver. 3.0.161 are used.

Between-region comparisons are presented by bar and line charts andmaps, created with the interactive administrative map of Bulgaria (http://ikonact.free.fr/maps/).

RESULTS

After the 1960s there is a stable increasing trend in all-cause, crude death rate in Bulgaria. Our country is among those with the highest crude death rate not only on European, but also on a wider international level.

For the period 2000-2012, there are substantial territorial (between-region) differences in all-cause mortality presented with crude death rate. During the 13-year period, the crude mortality is increasing. Mortality for men and women, and for the whole population is at its highest in the regions of Vidin and Montana. In the Vidin region the crude death rate increases from 2118.02 (for 2000) up to 2344.53per 100 000 population in 2012 (the mean death rate for the period is 2197.90).The same trend is present in the Montana region, where the crude death rate was 2088.18 per 100 000 population in 2000, and rose up to 2158.54 in 2012(the mean crude death rate for the periodis 2037.72). These regions are with the highest proportion of people above 65, which explains to a certain extent the highest crude death rate.

In the most disadvantaged position for the 13-year period are the regions: Kardzhali, Blagoevgrad and Smolyan (Figure 1). The relative rate between the regions with the highest and the lowest crude all-cause mortality is 2.00, and the absolute difference is 1098 per 100 000 population per year.

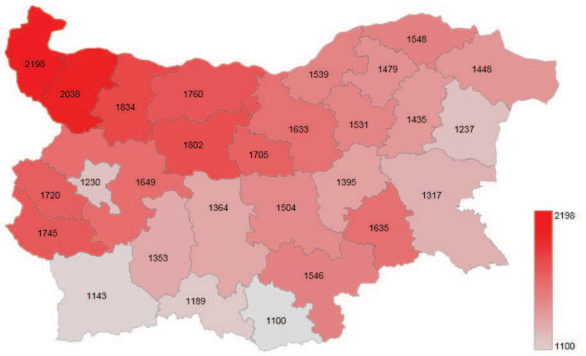


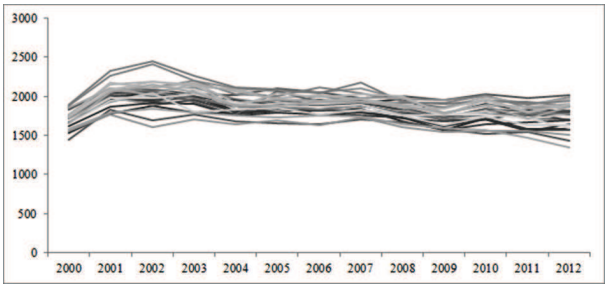
Figure 1. Crude all-cause mortality by region for the period 2000-2012

When comparing crude rates, the different age and gender structure of the regions is not accounted for. That is why for achieving a more adequate comparison on a regional level a direct age standardization of all-cause mortality is applied.

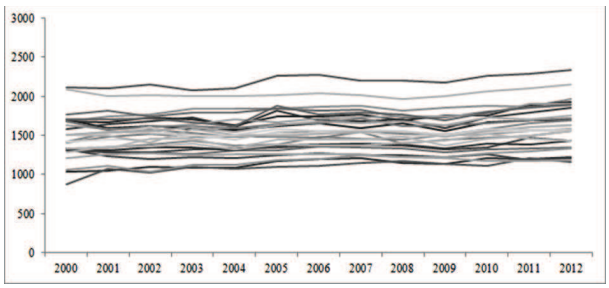
Age-standardized and crude all-cause mortality rates by region, average for the period 2000-2012, and separately for each year in the period are presented in Figure 2 and Table 1.

The differences between the means of the age-standardized and crude all-cause mortality for the period among all regions is statistically significant ($z=-4.44$, $p<0.0001$).The analysis of the difference between age-standardized and crude rates by gender also achieves significance. For men, the difference between standardized and crude all-cause mortality between all regions is $z=-4.623$, $p=0.000$, and for women it is $z=-2.960$, $p<0.003$.

When comparing the means of the age-standardized all-cause moratlity rates of all 28 regions



Age-standardised mortality



Crude mortality

Figure 2. Variation between age-standardized and crude all-cause mortality for the 28 regions for the perdiod 2000-2012

Table 1. Crude and age-standardized all-cause mortality (SE and 95% confidence interval) by year for the period 2000-2012

Years	Crude mortality	Age-standardized mortality (R)	SE of R	95% CI of R	
2000	2081.13	2575.80	5.89	2564.26	2587.33
2001	1423.98	1975.53	6.16	1963.46	1987.59
2002	1435.37	1989.96	6.19	1977.84	2002.09
2003	1434.73	1963.20	6.21	1951.04	1975.37
2004	1418.75	1855.11	5.89	1843.57	1866.66
2005	1468.81	1873.96	5.77	1862.64	1885.28
2006	1477.19	1863.25	5.76	1851.96	1874.54
2007	1479.06	1869.57	5.87	1858.07	1881.07
2008	1453.00	1794.17	5.74	1782.92	1805.41
2009	1428.77	1710.69	5.43	1700.05	1721.33
2010	1467.91	1769.50	5.40	1758.91	1780.10
2011	1477.48	1682.35	5.21	1672.14	1692.55
2012	1500.17	1702.96	5.22	1692.72	1713.19

for the period 2000-2012, no significant between-region variationis found (Figure 3). The relative risk in age-standardized mortality is only 1.28, but the absolute risk between the regions with the highest and the lowest rates is 450.5 per 100 000 people per year.

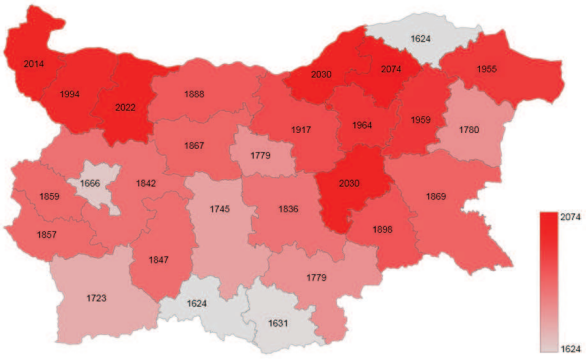
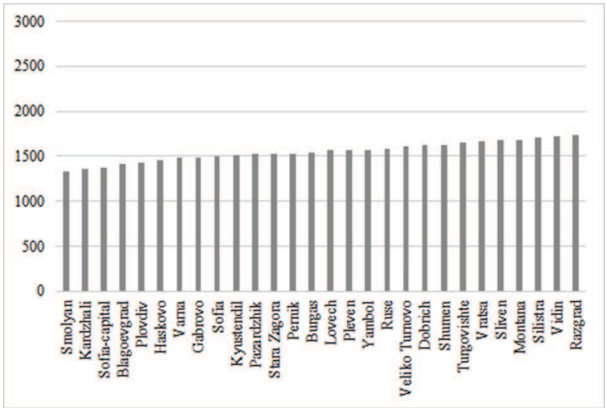


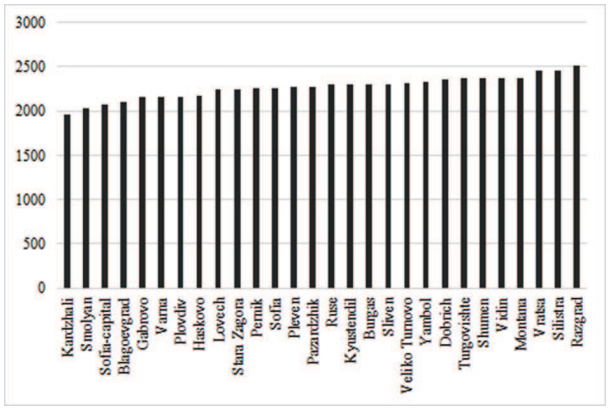
Figure 3. Mean age standardized all-cause mortality by region for the period 2000-2012 per 100 000 per year

The average age-adjusted all-causemortality for the period is highest for the regions:Razgrad, Silistra,Vratsa, followed by Vidin, Montana and Targovishte. The lowest age-adjusted all-cause mortality is found in the regions: Smolyan, Kardzhali, Sofia-capital.

The variations between regions in all-cause mortality are not substantial, but there is a clear, stable north-south gradient with higher rates in the northern parts of the country. Such a gradient is reported for other countries as well – United Kingdom (Townsend and Davidson, 1982; Britton et al., 1990), France (Romon I.,et al., 2008), Germany (Müller-Nordhorn J., et al., 2004), Austria (Stein K.



female



male

Figure. 4. Age-standardized all-cause mortality by regions and gender per 100 000

et al., 2011), Finland (Ministry of Social Affairs and Health. Social Welfare and Health Report 2000), Belarus (Grigoriev P., 2013) etc.

An analysis of age-adjsuted all-cause mortality by gender reveals that the trends and ranking of regions among men follow those for the whole population. With highest mortality for men are the regions: Razgrad, Silistra, Vratsa. The all-cause age-adjusted mortality rates are lowest in Kardzhali, Smolyan and Sofia-capital (Figure 4).

The ranking of the regions is somewhat different among women: the highest average all-causes risk for mortality is for the women in Razgrad, Vidin, Silistra, Montana and Vratsa. The lowest risk is for the women in Smolyan, Kardzhali, Sofia – capital (Figure 4).

The relative risk between the highest and the lowest value among men is RR=1.28, the same for both genders, and the absolute difference is 553.4 per 100000. The relative risk between the highest and

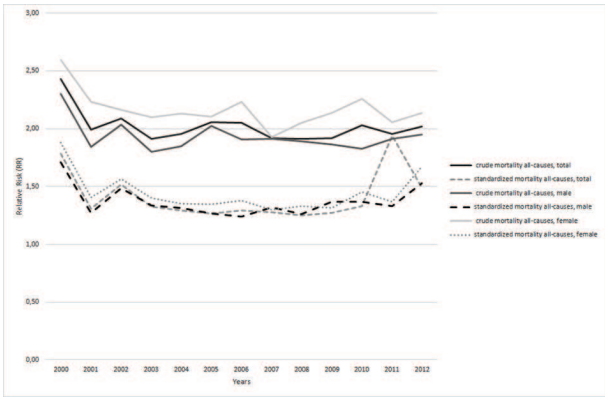


Figure 5. Relative risk expressed by standardized and crude indicators by gender and years

the lowest value among women is RR=1.31, a little bit higher compared to men and both genders, and the absolute difference is 416.6 per 100 000 women (Table 2).

The dynamics within the differences among the regions for the 13-year period are marginally ex-

Table 2. Average relative and absolute risk among the regions with the highest and the lowest all-causes mortality, for the period 2000-2012

	Standardized mortality			Crude mortality		
All-causes	Total	Male	Female	Total	Male	Female
Relative risk	1.28	1.28	1.31	2.00	1.91	2.10
95% CI, p<0.001	1.22÷1.33	1.23÷1.33	1.26÷1.38	1.92÷2.08	1.84÷1.99	2.01÷2.19
Absolute risk	450.48	553.40	416.57	1097.83	1095.02	1104.62
95% CI	434.25÷466.71	533.46÷573.34	400.48÷432.67	1084.42÷1111.24	1080.95÷1109.09	1090.12÷1119.12

pressed. The relative differences are bigger at the beginning of the period (year 2000) with a difference of 71%, and during the last two years (2011 and 2012), with a difference of 85%. The difference among the regions with the lowest and the highest all-causes mortality is 50% (Figure 5).

CONCLUSIONS

The variations among the regions expressed by standardized mortality are considerably lower than if expressed by crude mortality.

The regional disparities in the standardized all-causes mortality are not that big and remain constant for the period under investigation. The fact that the variations do not increase, is somehow „reassuring". On the other hand, notwithstanding the short period under investigation, "unfavorable health zones" are formed.

It is important to note the change in the direction of the trend of the all-causes mortality. For the 13-year period the crude mortality increases, and the all-causes standardized mortality shows a slight tendency for decrease.

The regional disparities in mortality can successfully be used for assessment of the health status of the population and health policy decisions on regional and local level, if a routine access to standardized mortality indicators is provided.

REFERENCES

1. Bonneux Luc G., Huisman Corina C., de Beer Joop A. Mortality in 272 European regions, 2002–2004: An update. European Journal of Epidemiology. 2010;25:77–85. doi: 10.1007/s10654-009-9415-y
2. Britton M., Fox A., Goldblatt P. et al (1990) 'The influence of socio- economic and environmental factors on geographic variations in mortality', in Britton M (ed), Mortality & Geography A review in the mid-1980s, Office of Population, Censuses and Surveys: London.
3. Grigoriev P., Doblhammer-Reiter G., Shkolnikov V., Trends, patterns, and determinants of regional mortality in Belarus, 1990–2007, Popul Stud. 2013 Mar; 67(1): 61–81.)
4. Hacking J., Muller S., Buchan I., Trends in mortality from 1965 to 2008 across the English north-south divide: comparative observational study, BMJ 2011; 342 doi: http://dx.doi.org/10.1136/bmj.d508
5. Kibele E., Klüsener S., Scholz R., 2015, Regional Mortality Disparities in Germany Long-Term Dynamics and possible Determinants, Köln Z Soziol (2015) (Suppl) 67:241–270, DOI 10.1007/s11577-015-0329-2
6. Ministry of Social Affairs and Health. Social Welfare and Health Report 2000. Helsinki, Finnish Parliament, 2000 http://www.stm.fi/english/eho/publicat/report2000/health2000.pdf
7. Müller-Nordhorn J., Rossnagel K., Mey W., Willich SN: Regional variation and time trends in mortality from ischaemic heart disease: East and West Germany 10 years after reunification. J Epidemiol Community Health. 2004, 58 (6): 481-5. 10.1136/jech.2003.013367.
8. Revision of the European Standard Population Report of Eurostat's task force, ISSN 1977-0375, 2013 edition, Theme: Population and social conditions Collection: Methodologies & Working papers © European Union, 2013
9. Romon I., Jougla E., Balkau B., Fagot-Campagna A: The burden of diabetes-related mortality in France in 2002: an analysis using both underlying and multiple causes of death. Eur J Epidemiol. 2008, 23 (5): 327-34. 10.1007/s10654-008-9235-5.
10. Shaw M., Scott O., Nicola B., Danny D., Widening inequality in mortality between 160 regions of 15 European countries in the early 1990s. Social Science & Medicine. 2000;50:1047–1058. doi: 10.1016/S0277-9536(99)00354-8.
11. Stein K., Rieder A. and Dorner T., 2011, East-West gradient in cardio-vascular mortality in Austria: how much can we explain by following the pattern of risk factors?, International Journal of Health Geographics 2011. 10:59, DOI:10.1186/1476-072X-10-59