საერთაშორისო სამეცნიერო კონფერენცია „ბუნებრივი კატასტროფები საქართველოში: მონიტორინგი, პრევენცია, შედეგების შერბილება“, შრომები, თბილისი, საქართველო, 12–14 დეკემბერი, 2019 წ.
International Scientific Conference „Natural Disasters in Georgia: Monitoring, Prevention, Mitigation“, Proceedings, Tbilisi, Georgia, December 12-14, 2019

CHANGEABILITY OF MORTALITY IN GEORGIA IN DIFFERENT SEASONS AND PERIODS OF YEAR INTO 1993-2017

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Summary: *The analysis of variations of mortality in Georgia in different seasons (winter, spring, summer, autumn) and periods (year, cold period – October-March, warm period: April-September) of year from 1993 to 2017 was carried out. It was found that over the entire study period, an average of 1230 deaths per 100000 people were recorded per year. The highest mortality was observed in winter (345 cases), the lowest – in autumn (274 cases). Over the indicated time period, in all different seasons and periods of the year there was an increase in mortality. So, in 2008-2017, compared with 1993-2002, the maximum increase in mortality was observed in autumn (63 cases), the minimum – in spring (40 cases each). On average over the year in 2008-2017, compared with 1993-2002, the growth in mortality was 197 cases per 100000 people.*

Key Words: *Mortality, environment and human health*

Introduction

Influences of natural, anthropogenic environmental (meteorological, climatic, geophysical, space, anthropogenic atmospheric pollution, etc.) and social (economics, life style, medical care, etc.) factors on the health of people are significant [1-5]. Seasonal variations in population mortality are well known, mainly due to the variability of the thermal regime in the atmosphere (intra-annual variation of air temperature, heat and cold waves, etc.) [1-10].

In this work the statistical analysis of seasonal (winter, spring, summer, autumn) half-years (cold period – October-March, warm period: April-September) annual variations of mortality in Georgia in the period from 1993 to 2017 was carried out.

Material and methods

Data of National Statistics Office of Georgia [https://www.geostat.ge/en] about mortality in Georgia in 1993-2017 is used.

The standard statistical methods are used. The following designations will be used below:

Mort – mortality per 100000 people; Min – minimal values; Max – maximal values; St Dev – standard deviation; σm – standard error; Cv = 100·St Dev/Average – coefficient of variation, %; 99%(+/-) – 99% confidence interval of mean.

Comparison of mean values of mortality in two ten-year time periods (1993-2000 and 2008-2017) was produced with the use of Student's criterion with the level of significance α not worse than 0.01.

Results and discussion

Results in Table 1 and Fig. 1-4 are presented.

In Table 1 the statistical characteristics of seasonal, half-years and annual mean values of mortality Georgia in 1993-2017 are presented. As follows from Table 1 seasonal mean values of mortality per 100000 people changes from 274 (autumn) to 345 (winter). The mean annual mortality per 100000 people is 1230±54, in the cold half-year 654±30 and in the warm half-year – 576±26.

The variability of mortality in autumn higher than in winter and spring. Accordingly, values of Cv varied from 11.9% to 8.2%.

Table 1

Statistical Characteristics of Mortality in Georgia
in 1993-2017 in Different Seasons and Periods of Year

Month	Mean	Min	Max	St Dev	σ_m	Cv (%)	99%(+/-)
Winter	345	292	395	28,3	5,8	8,2	15
Spring	334	281	378	27,3	5,6	8,2	14
Summer	277	227	322	27,1	5,5	9,8	14
Autumn	274	209	318	32,6	6,7	11,9	17
Cold	654	546	733	56,7	11,6	8,7	30
Warm	576	472	646	49,7	10,1	8,6	26
Year	1230	1021	1362	104,1	21,2	8,5	54

Trends of mortality in Georgia in 1993-2017 in indicated seasons of year are positive and have the form of a second power polynomial (Fig. 1). In recent years, there has been some stabilization and a downward trend in mortality.

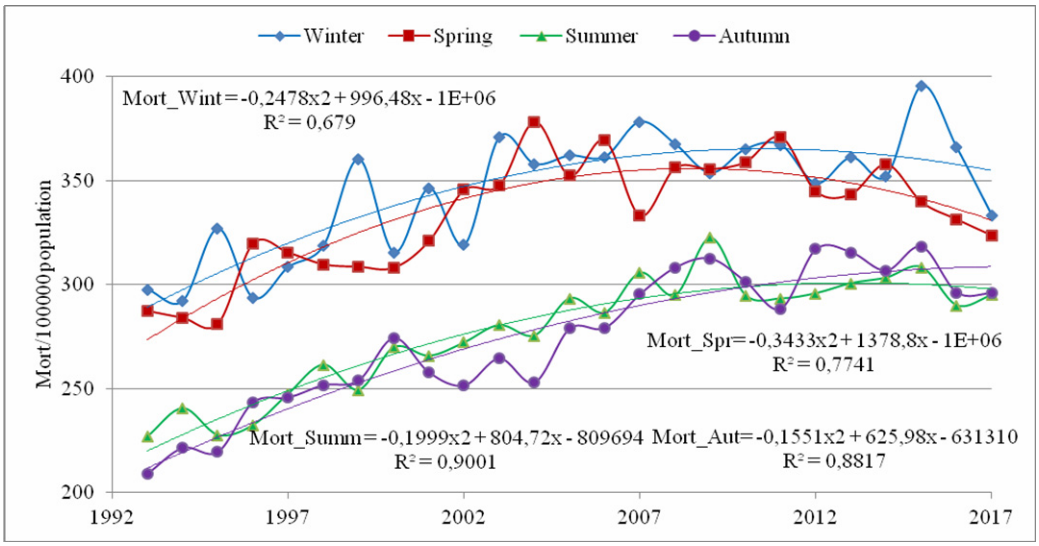

Fig. 1. Trend of Mortality in Georgia in 1993-2017 in Three Seasons of Year.

Trends of mortality in Georgia in 1993-2017 in three indicated periods of year also are positive and have the form of a second power polynomial (Fig. 2).

In Fig. 3 data about intra-annual variations of mortality in Georgia on three periods of years are presented. As follows from the Fig. 3, in the second period of time (2008-2017), mortality in Georgia in all indicated seasons of year, was higher than in the first period (1993-2002).

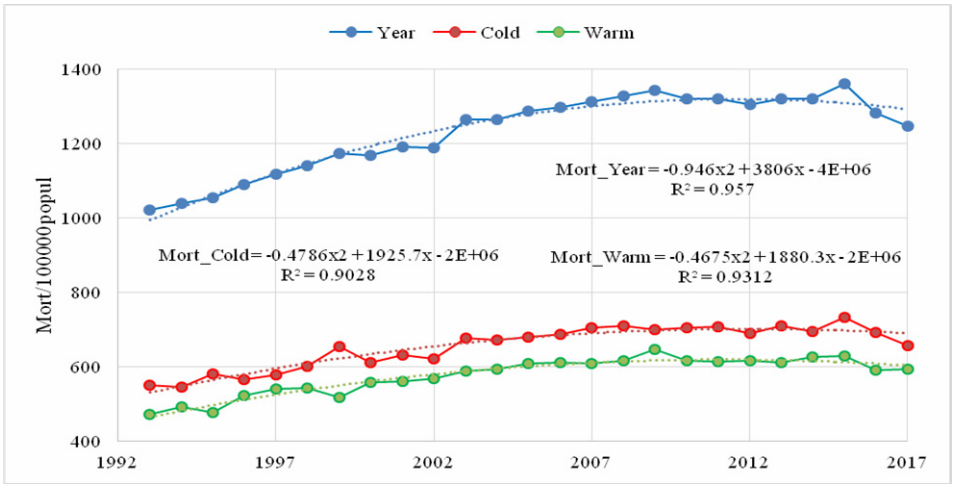

Fig. 2. Trend of Mortality in Georgia in 1993-2017 in Three Periods of Year.

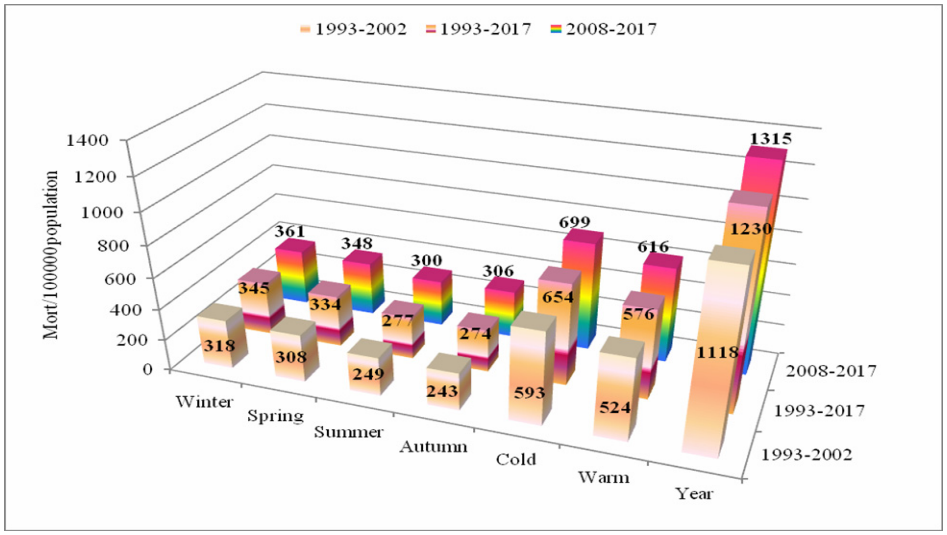

Fig. 3. Intra-Annual Variations of Mortality in Georgia in Three Periods of Years.

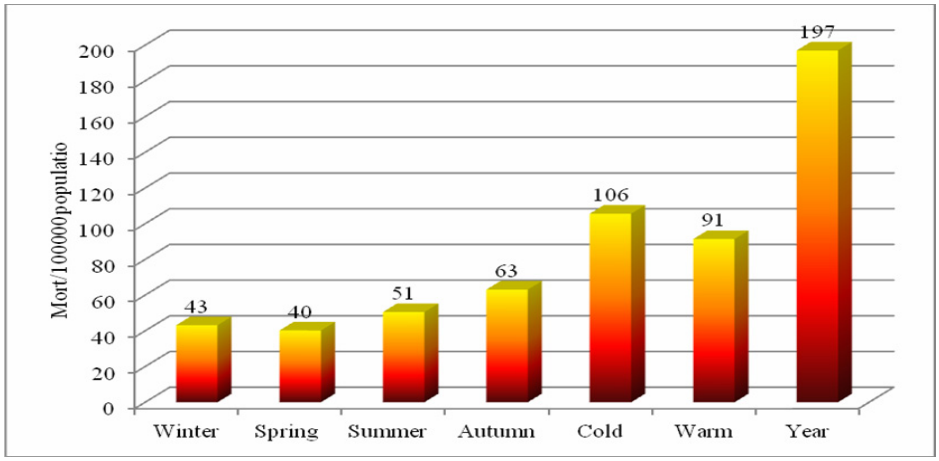

Fig. 4. Difference between Mean Values of Mortality in Georgia in 2008-2017 and 1993-2002 in Different Seasons and Periods of Year.

So, in 2008-2017, compared with 1993-2002, the maximum increase in mortality was observed in autumn (63 cases), the minimum – in spring (40 cases each). On average over the year in 2008-2017, compared with 1993-2002, the growth in mortality was 197 cases per 100000 people, in cold period – 106, and in warm period – 91 cases per 100000 people.

Conclusion

The more detailed analysis of the data about mortality in Georgia with the use of statistical methods for the non-accidental series of observations is planned to be conducted in the immediate future, as well as the study of the role of various natural, anthropogenic environmental and social factors in such negative processes in Georgia, as growth of mortality.

References

1. Amiranashvili A., Bliadze T., Chikhladze V. Photochemical Smog in Tbilisi. // Monograph, Trans. of Mikheil Nodia institute of Geophysics, ISSN 1512-1135, vol. 63, Tb., 2012, 160 p., (in Georgian).
2. Amiranashvili A.G., Japaridze N.D., Khazaradze K.R. On the Connection of Monthly Mean of Some Simple Thermal Indices and Tourism Climate Index with the Mortality of the Population of Tbilisi City Apropos of Cardiovascular Diseases. // Journal of the Georgian Geophysical Society, ISSN: 1512-1127, Physics of Solid Earth, Atmosphere, Ocean and Space Plasma, v. 21(1), 2018, pp.48-62
3. Amiranashvili A.G., Japaridze N.D., Kartvelishvili L.G., Khazaradze K.R., Khazaradze R.R. Effects of Variations of the Monthly Mean Air Temperature on the Population Health of Imereti Region of Georgia. // International Scientific Conference „Modern Problems of Ecology“, Proceedings, ISSN 1512-1976, v. 6, Kutaisi, Georgia, 21-22 September, 2018, pp. 38-41.
4. Amiranashvili A., Amiranashvili V., Kartvelishvili L., Nodia Kh., Khurodze T. Influence of Air Effective Temperature and Geomagnetic Storms on the Population of Tbilisi City. // Trans. of the Institute of Hydrometeorology, v. No 115, ISSN 1512-0902, Tbilisi, 2008, pp. 434 – 437, (in Russian).
5. Amiranashvili A.G., Japaridze N.D., Kartvelishvili L.G., Khazaradze K.R., Matzarakis A., Povolotskaya N.P., Senik I.A. Tourism Climate Index of in the Some Regions of Georgia And North Caucasus.// Journal of the Georgian Geophysical Society, Issue B. Physics of Atmosphere, Ocean and Space Plasma, v. 20B, 2017, pp. 43–64.
6. Amiranashvili A., Chargazia Kh., Chikhladze V., Japaridze N., Khazaradze K. The Monthly Variations in Mortality from the Cardiovascular Diseases in Tbilisi. // Georgian Medical News, N 5 (242), 2015, pp. 53-59.
7. Marti-Soler H., Gonseth S., Gubelmann C., Stringhini S., Bovet P., et al. Seasonal Variation of Overall and Cardiovascular Mortality: A study in 19 countries from different geographic locations. // PLOS ONE 9(11) 2014; e113500. doi:10.1371/ journal.pone.0113500.
8. Gomez-Acebo I., Llorca J., Dierssen T. Cold-related Mortality due to Cardiovascular Diseases, Respiratory Diseases and Cancer: a Case-Crossover Study. // Public Health, 127, 2013, pp. 252–258.
9. Ruuhela R., Jylhä K., Lanki T., Tiittanen P., Matzarakis A. Biometeorological Assessment of Mortality Related to Extreme Temperatures in Helsinki Region, Finland, 1972–2014. // Int. J. Environ. Res. Public Health, eIISSN 1660-4601, 14(8), 944, 2017, 19 p., doi:10.3390/ijerph14080944, file:///C:/Users/User/Downloads/ijerph-14-00944.pdf
10. Muthers S., Laschewski G., Matzarakis A. The Summers 2003 and 2015 in South-West Germany: Heat Waves and Heat-Related Mortality in the Context of Climate Change. // Atmosphere, November 2017, 13 p., DOI: 10.3390/atmos8110224, https://www.researchgate.net/publication/321085363