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Original Research Article

Trends and regional inequalities in mortality from stroke in the context of health care reform in Lithuania

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ABSTRACT

Background and objective: The objective of the study was to analyze mortality from stroke in Lithuania the context of health care reform with particular interest in urban/rural and regional inequalities. Based on the analysis of trends in mortality, and to detection of break-points over two decades of socioeconomic transition, it focused on the challenges in stroke care provision.

Materials and methods: The analysis covered the entire country. Information on deaths from 1991 to 2012 was gathered from death certificates held by the Lithuanian Department of Statistics. The joinpoint analysis was used to identify the best-fitting points, wherever a statistically significant change in mortality occurred. Age-standardized mortality rates were calculated for 60 municipalities of Lithuania.

Results: The positive break-points in mortality from stroke were registered in 2007 for females and 2008 for males, when the increasing trends reversed to the declining. More positive changes occurred in urban areas, where stroke mortality is lower compare to rural since 1996. Considerable inequalities were disclosed among administrative regions of Lithuania: ratio between the highest and the lowest rates in different municipalities reached 4.88 for males and 3.35 for females.

Conclusions: There are good reasons to expect the favorable stroke mortality trends observed will follow the same direction in the future. Stroke centers are growing up in their competence while networking is also under the development. The new strategies in stroke care should result not only in the declining mortality rates and numbers of severely handicapped stroke patients, but also in diminishing regional and urban/rural inequalities.

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1. Introduction

The rapid political and economic changes in Lithuania exerted a great influence on the health of the population. Mortality could be considered as one of the major indicators reflecting the changes in health outcomes. Over the last few decades, several studies analyzed trends in major cause mortality in Lithuania [1–5]. The only published data on stroke mortality in Lithuania came from the Kaunas Register of Stroke [6]. While being population based, stroke register, however, provides data for a limited age range (25–64 years) and just for urban population making extrapolation to the total population questionable. For the entire country, trends in mortality from stroke were not analyzed over the period of transition, no analysis was done to identify the calendar years in which changes occurred. Furthermore, no assessment has been made of the urban/rural and regional inequalities in mortality from stroke for Lithuanian population.

The aim of this study was to look at the situation of mortality from stroke in the context of health care reform with particular interest in urban/rural and regional inequalities in stroke mortality. Based on the analysis of trends in mortality and on detection of break-points over two decades of socioeconomic transition, it focuses on the challenges in stroke care provision.

2. Materials and methods

The analysis for this study covered the entire country. Information, gathered on deaths from 1991 to 2012 for the population, was from death certificates, held by the Lithuanian Department of Statistics. The established cases of stroke – International Classification of Diseases (ICD-9) codes 98–99 for 1991–1992; 430–438 for 1993–1997; and ICD-10 codes I60–I69 since 1998 – have been analyzed. The changes in classification throughout the period of investigation, did not affect statistics of cerebrovascular diseases. Throughout the period under investigation, the population size declined from 3.7 in 1991 to 3.0 million people in 2012.

Trends in mortality from stroke were assessed for the total population, as well as for the urban and rural populations, separately for males and females. Definitions of urban and rural areas are based on the Law on the Territorial Administrative Units of the Republic of Lithuania and their Boundaries. Mortality rates were age-standardized using the European standard, as recommended by the World Health Organization. The joinpoint regression model was applied to describe data on trend changes [7]. Joinpoint regression is a Windows-based statistical software program that enables a user to test the statistical significance of an apparent change in trend. In this analysis, the best fitting points, where the rate changes significantly (increase or decrease) are chosen [8]. The analysis started with a minimum number of joinpoints, and tested whether one or more cut points were statistically significant, and whether or not they could be added to the model. In the final model, each joinpoint indicated a statistically significant change in a trend; computed next was the annual percent of change for each of those trends. For Joinpoint analysis, the overall significance level was set at $P = 0.05$. Significant changes included changes in direction or rate of the trend. The permutation test – testing the number of joinpoints 0 against 2 – was applied in this case, because the 20-year period did not allow obtaining statistically significant results for more joinpoints. Coefficients of regression, multiplied by 100, were presented as average annual changes (AAC), which were considered to be statistically significant at the $P < 0.05$ level. This methodology assisted in identifying the occurrence of changes in mortality form stroke during distinct periods.

The next part of the study sought to determine the regional inequalities in stroke mortality. The definition of municipalities was also based on the Law on the Territorial Administrative Units of the Republic of Lithuania and their Boundaries. The municipality is a territorial administrative unit, which is governed by institutions of local authorities. The basic criteria of a municipality are its preparedness to manage and maintain its environment, municipal economy, to provide communal services to local inhabitants and to perform other functions. The size of municipalities varied from 2519 to 538,988 inhabitants in average in 2008–2012. Rural municipalities are called ''regional'' or ''regions,'' meaning that this population is attributed to the rural. Age-standardized mortality from stroke was calculated for all 60 municipalities of Lithuania. The 5-year period (2008–2012) was selected in order to circumvent annual fluctuations in the data, which may have been occurring in these regions. Mortality rates with 95% confidence intervals were assessed.

3. Results

3.1. Critical points in mortality from stroke throughout the period of 1991–2012

In 2012, stroke accounted for 17.50% of deaths for males and 22.53% for females among all deaths from cardiovascular diseases, while in the overall mortality structure it took 8.14% and 14.69%, respectively. The proportion of stroke decreased slightly since 1991, particularly for females, nevertheless, this cause of death still remains of the great importance.

Throughout the entire study period, mortality from stroke had insignificant declining tendency for males, which was caused by considerable varying transformation during the last two decades. For females, statistically significant decline was observed. Based on joinpoint analysis, the years 1994, 2001, and 2008 can be assumed to be the significant change points of mortality rates for males, while for females, the break-points were observed in 1999, 2002, and 2007 ($P < 0.05$). The most favorable joinpoint was observed in 2008 for males and in 2007 for females, when the increasing trend reversed to the statistically significant decline with an average annual change of −2.34% in males and −2.60% in females (Figs. 1 and 2).

3.2. Urban/rural and regional patterns in mortality from stroke

Mortality from stroke in rural areas was lower both for males and females since the beginning of the study period (1991) till